# Electrical Experimenter









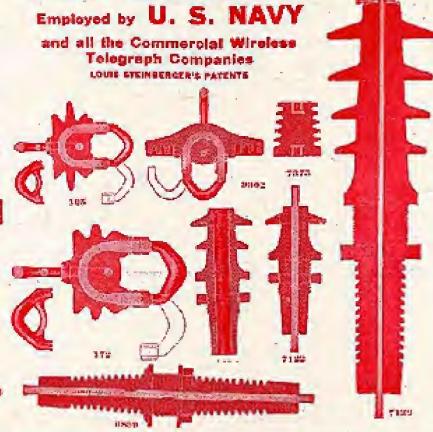








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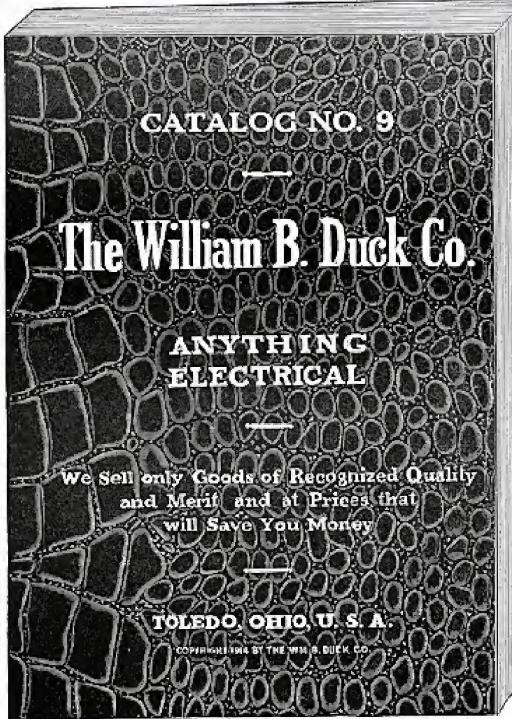
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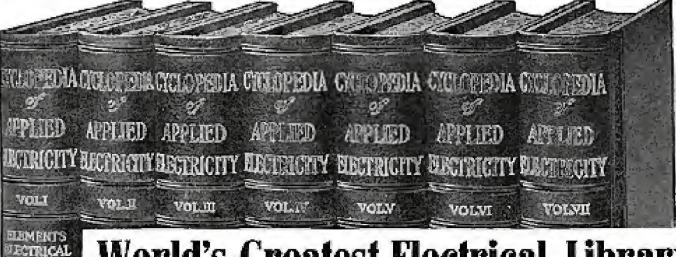
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# The Electrical Experimenter

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Vol. III Whole No. 31

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## New York to Honolulu by Radio Phone

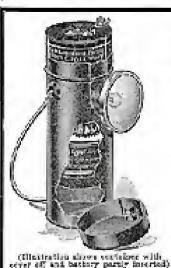
EPTEMBER 29, 1915 marks another milestone in the history of Wireless. On that date, for the first time, she human voice was projected through free space over the immense distance of 4,900 miles. The new wireless telephone here triumphed over the old wire telephone in an astonishing manner, for up to this time the greatest distance covered by the wire telephone was but 4,750 miles. Nor is the vanquishing of this enormous distance by the Radio Phone the greatest accomplishment of the feat as a whole. For when Mr. Vail at New York on that memorable date hurled his voice through 4,900 miles to Honolulu, where Lloyd Espenseliied caught it over his aerial, Mr. Vailwas not using the Wireless Phone at all. He spoke into an ordinary desk phone transmitter and his voice was thence relaved by the big Arlington Wireless station. Here, by means of gas valves of the Audion type, the impulses of the voice were "stepped up" till they were finally strong enough to operate the sending apparatus. Thus the feeble voice arriving at Arlington absolutely controlled several hundred horsepower -300 biliotouts to be accurate—and it was this enormous energy that was then radiated out into space for thousands of miles. While we know definitely that during this test the human voice was carried through 4,000 miles of ether, it is guite certain that the impulses were carried much

further than this distance. Indeed, we do not doubt that if we had only the proper receiving apparatus, Mr. Vail's voice could have been clearly heard over twice the covered distance. Indeed we are not at all sure that the waves from the smallest amateur station do not travel all around the world. While this may sound iaustastic, let us consider that each succeding year, as our detectors become more sensitive, less and less power is required for transmitting. With a modern amplifying set, small stations can now be heard over astonishing distances, never dreamt of less than a decade ago-

In this respect we can compare the detector with a telescope. The more we can magnify, the further we are enabled to see, and there seems to be no limit to the distance that can thus be envered. It is precisely the same with a Radio detector; the more sensitive we can make it, the further away will we be able to receive messages from a given station. There seems to be no limit to the distance that can be covered in this manner.

Truly, while this recent feat has been a signal achievement, we confidently look forward to that time—not far off, we think—when it will be possible to talk from New York to Chicago with a power derived from six small dry cells.

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Vol. III. Whole No. 31

NOVEMBER, 1915

Number 7

#### The Electro-Magnetic Gun and Its Possibilities

W HILE we have heard of many dif-ferent kinds of life descriping guns and other weapons during the present European conflict in all its magnitude, there are probably not many of us who have supposed to think of the possibilities of a somewhat unknown invention which relates to nothing less than the harding of large projectiles through space by means of electro-magnetism properly applied to a gun or cannon berrel.

There have been several patents issued on such devices, but to our knowledge mone of these have been adopted by any of the world powers. As an introductory explanation reference may be nowle in this connection to Fig. I, and undoubtedly the reader will then be able to group, with the aid of the following explanatory remarks, about how the various investors of the electro-magnetic guns intend burling their projectiles at the enemy with hair-raising

rapidity and necessary with neutronic exampled to line. I, and for the sake of simplicity, we may consider that but three electro-magnetic coils are in use as at 1, 2 and 3 along the gue barrel. It may be said that invariably such a gun barrel there are learned three are learned lining of brees are should have an inner lining of bress of bronge, so that the projectile which is usually made of a magnetic material (vocaas iron or steel), will not bind within the borret. The barrel proper can be usuale of iron properly divided, but an all brass barcel is common. Now consider that the three magnet coils, I, 2 and 8, are conneered up to a switch as shown. If, then, an iron projectile is placed in the position A, and the carrent caused to flow through the coil 1, the electro magnetic field of force set up within the gun harrel will tend to guil the projectile forward in the direction of the arrow. It should be mentioned before going farther that the iron barrel (if used) of the campon or can in divided up into several distinct secsions so as to localize and intensify the magnetic pull on the projectile at each new impulse. Of course, this scheme outlined at Fig.

I is only mentioned to bring out the general theory of how these guns are ent-posed to operate. To continue: when the projectile has reached the position of coil I the control switch is showed so us to out out coil I and to consect coil 2 into circuit. If this is done quickly the projectile with have been sucked forward on a line with roil 2. The operation is again expected

and the switch is moved so that coil 3 will be put into the circuit and wills I and 2 opened. Thus the projectile will again be putled forward to section 2, and at the inatant it reaches the center of the final coil the current is out off and the mounculam nequired by the projectile is relied upon to carry it or and out of the mazzle of the gun at B. This design is the basis of most of the patents on this unique device, which has yet, we may say, to be proven in a quartical sense for modern warrare re-quirements, although it seems indeed to process possibilities if the details are properly worked out.

The wash drawing illustration here presented at Fig. 2 shows how we may conduct warfare in the future if the powers that he sail think that the only way to settle an argument is by main strength and ignorance. In our illustration is shown a probable development of a large electromagnetic field gum mounted on a massive ison frame work fitted with large enterpillar wheels, as observed, an that it is mobile estough to be quickly hauled from one place to another on the battlefield or for siege purposes. When used for portable requirements it will invariably be accessury, if such guns are ever adopted, to provide a complete pertable electric generating plant as is shown in the picture.

This would comprise a powerful gasoline

engine direct connected to a suitable electric Cymanio.

Some idea of the probable size of such guns may be obtained when it is stated that one of the best designs ever worked out on this principle, and due to Prof. Birke-land, has a harrel 90 feet in length. The projectiles used in this gen would be about 9 feet long and have a diameter of 19 Also to gain the maximum maginches. netic pull by this atrangement it is recommended that the projectile he would with coils of wire so as to be electro-muchetically reactive in conjunction with the regular magnetic disc coils placed along the barrel of the gun as perceived. In order to facilitate the passage of the projectile through the barrel of the gun with the able lubrication be provided by means of grouse or oil cups placed along the barrel of intervals; these may be observed in our illustration Fig. 2. least friction we strongly suggest that suit-

It must be remembered that these guns worshi can best to any appreciable extent

and not at all compared to the heat produced in the modern high powerest guns using explosive charges of powder. Due to this and other obvious reasons such a gun as this can fire a great number of larger chliber shells per minute, possibly fifty to seventy-live shells in one minute. It will be ocen from the foregoing that such a discharge of 12 mels shells, each of which contains a very high explosive powder charge, would wave to quickly rout the enemy, no matter how well he might be entreached or ensconced behind fortihed embanisments. A gain of such monitor shells would batter down almost any fortification whether natural or built by man. A method is suggested in the illustration of this electro-magnetic gun of the future whereby a constant supply of shells for rapid fieling can be always maintained before the open breach of the gun. The shelts might be hoisted by means of a gasoline engine and run on the pianform at the lest and then allowed to slide by as one test was these anomes to state by gravity down the inclined churc. As fast as one of the shells is sucked into the breach of the gun barret it is followed by another one right after it successively. It is easily possible to have means of fiding the shells as far agart, in respect to time, as is deemed advisable, of course. The electric current sugglied through the anils along the gun barrel can be controlled through a suitable switch by the man aluing the gun and who may be located alongside of the breach of same as proceived i⇒ our illustration.

Such guins as these firing 19-inch explosive shells may have a range of twenty-live miles or more. The shells may carry time fuses, or shey may be of the concussive explosion type, whereby they do not explode or burst until they his the ground or the wall of a fort, etc.

Of course, those magnetic guns are practically noiseless and naturally also obsolately smokeless. Furthermore the wear and year or depreciation, in so for an the gun barrel lining is concerned, is very lew compared with modern canton and other arms using explosive charges to expel the bulkt of sixil from the barrel of same. The she is as bullets in such cases. must fit very tightly so as to prevent the exploding charge in the gan barrel from logking out and at she same time to force the shell outward with all available power. In suggestic country the shell does not

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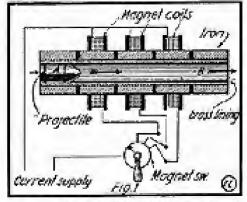
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necessarily have to fit the barrel tightly and thus friction can be vasily reduced. Moreover, there is no pitting or other wear on the inside of the barrel, due to powder explosions as just mentioned.

At Fig. 3 is shown a prient issued to S. T. Foster, Jr., (No. 811,918) on an electromagnetic gen. This patent will serve to give a fair idea as to the general make-up of these devices intended to supplant the modern artillery now in use by world powers. Mr. Foster arranges a series of power but electro-magnetic coil windings along the non-magnetic gue barrel 11-12. The magnetic projectile made of iron or steel is placed in the breach at 11, just far enough to reach the electric contact I. When this contact is depressed by the shell it closes the electric circuit through the magnetic coil 15. This causes the shell to be pulled forward, and as the forward section of the projectile then engages the cut-out switch 2, it depresses same and excites the magnetic coil 16. The projectile is then pulled forward electro-magnetically until it is in line with roil 16, and simultaneously actuates the cut-out switch 1, which opens the circuit to coil 16. At this instant, generally speaking, the shell in sliding forward into line with coil 16 has engaged the cut-out switch No. 3 and this classes the coil circuit 17, thus the shell is pulled forward into line with that coil and coil 16 is rul out of circuit, owing to the contact 2 having reset itself automátically at the contact 2 having reset itself automátically.

contact 2 kaying reset itself automatically. Thus it will be anest how the iron projectile is propagated through the barrel toward the autoale 12. The operation previously described repeats lessif until the shell reaches the position of coil 23, and here it strikes a cur-out switch 10, which opens the current circuit. No magnetic pull is further exerted on the projectile and it leaves the murale of the gun under its own momentum. The inventor in this case claims that the shell is supposed to gain velocity repeatedly and successively as it moves from each coil to the succeeding coil. This arrangement for cutting out the poils as the shell moves through the barrel is followed out in several other patents and seems to be a general idea with most of the inventions in this direction.

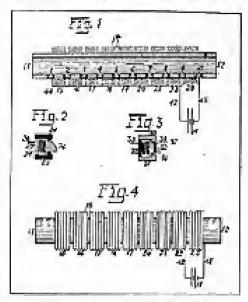
It would take up too much space here to describe in detail the very Ingenious mathematical and engineering deductions cited in the wonderful patent of Prof. Kristian Birkeland of Sweden. In his patent (U.S. Patent No. 754,037) he brings out some very fine points with regard to the development of the electro-magnetic gun. A few of the considerations there advocated,



Pig. 1. Elementary Diagram Showing Action of an Electro-magnetic fluor.

hypothetically and otherwise, are outlined below.

In the first place, it has been found difficult to make an electro-magnetic gum of ordinary size which will exert a sufficient pull on the projectile to gain the effects now produced by the modern explosive charge type of camon. Therefore this inventor proposes to arrange the arriches, etc., on his gun so that the current through the coils will only he left on for a very small fraction of a second in any case. Also in considering the regular approved engineering design of such magnetic coils



Pig. 3. Electio-magnetic Can Patent leaved to S. T. Poster, Jr.

he proposes not only to pass a normal extremit through the coll, but a current eventum times as heavy, or more, and thereby momentarily (for the fraction of a second), a terrific magnetic pull can be exerted on the iron their within the barrel, if e mentions further (and this is a capital idea) in order to increase the magnetic action in such a gun it is presented to make the projectile of iron surrounded by magnetic coils instead of iron alone.

Further achieves outlined in Prof. Strkeland's patent cover the arrangement whereby it is possible to open the magnetic coll circuit without any speak occurring at the break of the centrets. This is accomplished by taking advantage of the fact that the projectile moving through the barrel will induce electric currents in the magnet code and at the instant when this induced current is approximately equal to the current flowing through the coil and which, of course, passes through the coil in the opposite direction to the normal current, then the cut-out switch is operated with no sparking at same.

He goes on to say: "As to the dimensions which may be given to gues constructed according to my invention, the following example may be mentioned: For throwing an iron projectile weighing two tons and containing one thousand pounds of nitro-gelatin at an initial speed of one thousand feet per second I propose the use of a gun with a length of about ninety feet, the projectile being about nine feet long and having a diagneter of about nineteen inches. The gun selenoids may be made up of square wire, each solemoid containing seven hundred and twenty windings of a total resistance of fifteen ohms. The length of each solenoid is made about three-eighths of an inch and the height (radial dimension) about eight inches. With an electromotive force of three thousand volts this will give a current of two hundred amperes. If the current is set up simultaneously in all the selenoids (there will be about three thousand elementary solenoids), this will require altogether six hundred thousand amperes, and the sup-

tion acting on the projectile will be about two thousand five hundred pounds per square lock of the cross-sectional area of the projectile. A calculation shows that when a firing is to take place the current should be set up one seventh of a second before the firing. The projectile is then set free, and will pass the bersel in the course of ene-fifth of a second. The current has then been on the outsmost solenoid about one-third of a second. It, however, a construction is used in which all the groups of sedenoids are not at once excited less than half the current will be used for the same effect, and the generation of heat in the outermost solenoids will be reduced."

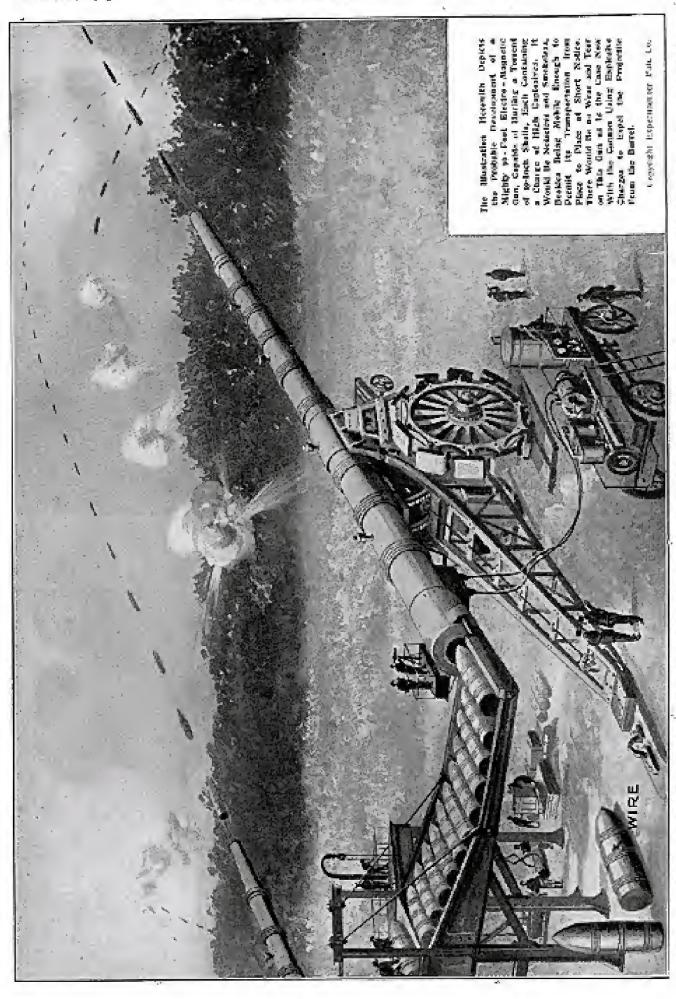
#### ENGINEERS FORMING RESERVE CORPS.

The movement began in a tentative way last spring to form a reserve corps of engineers to be available in case of war last assumed definite form, according to annumeroments made by Bion J. Arnold, of Chicago, chairman of the A. I. E. E. committee of the proposed reserve corps of engineers.

Some time ago the suggestion was taken up by the American Society of Civil Enginery, the American Institute of Mining. Engineers, the American Society of Mechanical linginous, the American Institute of Electrical Engineers and the American Institute of Consulting Engineers. Each of these organizations appointed committees to further the movement, which has now become more closely consultidated by the appointment, just announced of the chairman of various committees as members of a joint committee to take charge of the work in co-operation with the War Bepartment. The members of the committee are as follows: William Barchay Parsons, New York, Chilinam, and Henry S. Drinker, Pennsylvania; William H. Wiley, New York; E. I. Arnold, Illinois, and Ralph D. Mershon, New York.

#### INCREASING WIRELESS RANGE. BY KITHS.

The recent manoeuvies in northeastern Massachusetts were of particular interest because of successful experiments by the Signal Corps in amintaining a wireless secial at a great afritude by means of kites, and thereby increasing the efficiency of anordinary field radio set from six to six een times. At the invitation of Adjulant-Gen-eral Cole of the Massachusetts Volunteer Militia. Samuel F. Perkins, a maker and there of mon-litting kites, went to Newbury and experimented with the Signal Corpsand experimented with the Signal Corps. As there happened to be fairly strong winth at the time, Mr. Perkins was able to send up a string of kines to a height of 1,600 feet. The messages transmitted from the kite-supported aerial are said to have been received 150 miles away with distinctness, although the field witeless set used would only transmit messages 25 miles ordinarily. The results were obtained because the kites flew so steadily that the aerial was always maintained at a constant altitude. The reeciving qualities of the kite-supported aerial were remarkable. Messages were received from the battleship Georgia, off Newport, and from the Government stations at Arlington, Va., and Bermuda. Code messages being exchanged between two British warskips out in the Atlantic Ocean were received with securacy. Further experiments by the United States Government and Marconi officials are now being conducted, and it is expected that in a short time the range of sending from an ordinary field wireless set will be increased.



Phy. . Breibe-Mugnette finn al the Puttere, Whith Den Hart spalint light Captains Street and Norm. It Could Pie a Prefect String of Shells, Sufficient to Batter Bown the Strongest Ports.

#### Baron Münchhausen's New Scientific Adventures

By Hugo Gernsback

DR forty-one days I had been "listening in" nightly at my wireless set, since that event-ful evening when Baron Manchinaisen had left the Moon for the Planet Mars. He had said, of course, that it would take from \$5 to 40 days before the "Interstellar" could receive the tein form the Moon to Mars. negatiote the telp from the Moon to Mars, but nevertheless I became more and more impation; as the days were on.

impatient as the days were on.

At last on the evening of the 42d day, at it o'clock on the second, the peculiar, amoistakable high whining spark suddenly broke in my ears. After the long nervous strain, the loud whistling spark, almost took me off my feet and I could hardly hear the first words, I was so extited. In a few seconds the whistling spark died down, and Münchhausen's dear, sepukheal voice sounded once more in my faithful receivers. And how loud it was! It was listening to his "canned" voice, which perhaps 10 or 12 hours before had hem hurled haps 10 or 12 hours before had been hurled through the ether some 55 million miles away from the Moon, there to be registered phenographically on a telegraphone.

#### Münchhausen Lands On Mars

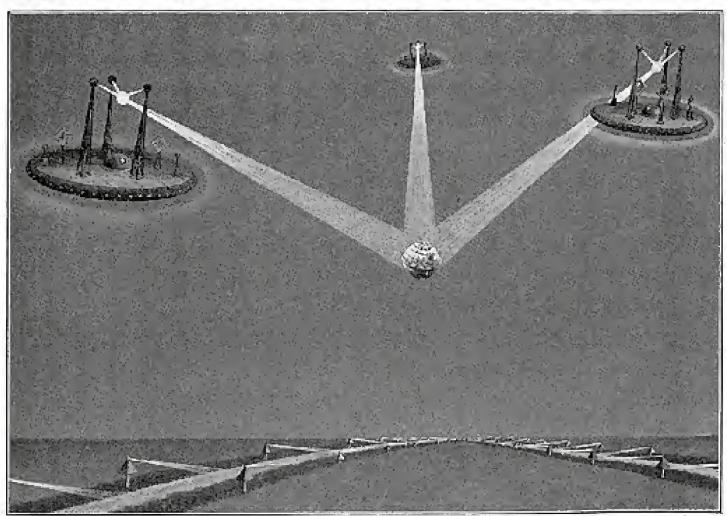
self? Too bad these is no return 'cir-cuit,' for I would love to hear your dear voice. It's over 44 days since I have last heard it. Yet it can't be helped. Well, you must be satisfied to listen to me, with-out being able to talk back; but I'll try to

out being able to talk back; but I'll try to be as explicit as possible, so that you will not be in a position to ask questions.
"Well, my boy, the trip from the Moon to Mars was unitedy uneventful. As soon as we had our bearings we made stroight for the Red Planet, the Mysterious. Flatternix and I took watches observately and as we had learned from our former experience how to handle the 'Interstellar,' the trip became more or less monotonous. perione flow to handle the Interstellar, the trip became more or less monotonous. We had a little trouble at the start with the switching of the Macconium retring, for it proved cather a passale to gravity-insulate the 'Interstellar' from the combined attractions of the Sate, the Farth and the Moon, and at the same time hav-ing the Planet Mary alone 'pull' us. This bothered us considerably for several days

terstellar was entirely grayity-insulated from the Moon. Earth and
Sun. We write then falling towards.
Mars of the rate of 20,000 miles an hour.
Within 10 days our speed had increased
to over 80,000 miles an hour, and the Earth
which from the Moon appeared 14 times
as large, as the Moon appears to you, had
strong and shrunk till it looked like a
small bright red dise. Mars in the meanwhile became rapidly larger and redder
and soon it appeared like an other dise,
At the end of the 86th day, when our speed
had increased to 78,000 miles an hour, due
to the preximity of the planet, the Earth
had become a bright slar in the formment,
somewhat brighter than the other stars. and become a seaght state it the eterative it, but a pitiful sight compared to what it had looked when seen from the Moon. But remember that the bloom is lost 233,000 miles distant from the Earth, while we were now over 30 million miles away from the Color of the Advanced.

it. Quite a little differenced

"The next day, the 36th since our start, we were but 200,000 miles distant from Mars, and the planet at this distance was indeed the most gargoous sight either FEt-



"Three Shaits of an Intense Vellow Ray Were Turned on us, and it was the Populier Properties of This Ray Which Had Made us Captives to the Martiana' Superior Intelligence. . . . . ."

And now the Baron's voice through the wireless telephone scuding plant on the Moor, 238,000 miles away from me, was taking? The thought made me shiver, "Hallo, Alier," it came in a sympathetic voice, "how is old mother Earth and your-

and we made but little headway during that period. Finally when the Moon, Parth and Sun, in the order named, were in a straight line, with Mars almost overhead, our speed rapidly increased and an the evening of the fourth day the "in-

ternix or myself had ever witnessed. Mars looked now almost as his to us as the Earth does when viewed from the Moon. If the Earth when so viewed is a wonderful agreetagle, the planet Mars when seen at such a small distance is simply overwhelming in its splender. We saw a full red disc, dazzlingly illuminated by the distant Sun's rays. Like the Earth, Mars has a pink fringe running around the edge—its atmosphere. The continents stand forth in an other sed, intermingled with dask green patches. Faint lines run over the entire face of the plants, like cobwebs—the famous Martian canals. At the top a brilliant white cap is observed—the north polar ice fields.

"But the most wonderful sight to us was Mars' two little moons. Flitternix calls.

Mars' two little moons, the at toy moons! Of these we had the best view the next day, when we were but some 19,000 miles distant from Mars.

\*\*The Planet Mars has two tiny moons, christened Phobos and Delmos by terrestrial astronomers. They were discovered in 1877 by Professor Asoph Hell, of the Washington Observatory, and they are so minute in size that only the most powerful telescopes on Farth seveal them. The largest, Phobos, is some 85 miles

in diameter, while the smaller, Deimos, is but 10 miles in diameter. The latter is such a ridiculously small world that a pedestrian would walk around its equator in a single day! An anomabile, given a fair road, could circle this mire world in one hour, without the same world in one hour.

without exceeding its speed first!!
"Phobos, the largest enoon, is less than
4,000 miles from the surface of Mass and revolves around the latter in the remark-aldy short time of 7 hours and 39 minutes. Consequently the Muritans witness the spectacle of their largest according through all its phases in 749 hours? In a single Martian morning therefore, Phobos can be seen to rapidly change from new moon to first quarier, then full moon, then last quarter and finally again new moon; and all this in 7% hours! A unique feature about Phobos, too, is that it revolves quicker around Mars than the latter re-volves upon he own axis. Mars turns around its exis in 24 hours, 37 minutes and 22 seconds. Thus the Martisu 'Gay' is almost & minutes longer than the ter-restrial day. During one Martin Cay, Phabos therefore has soon more than three times around Mars! As seen from Mars, Phobos appears about as large as the Moon appears to inhabitants of the Earth. Deimoe, the smaller moon, is 12,300 miles distant from Mars. Whereas, its larger brother takes but 755 hours to revolve around Mars, Deimos requires 182 hours. to complete sts circuit, or almost six days. Deimos, however, is so far removed from Mars and it is such a tlay object that to the Martings it really does not appear as a moon at all, as we understand that term. For it must be apparent that if we view an object measuring 10 miles seress from a distance of 12,300 miles, we can hardly expect to see much for that reason Drimes, when 'full' appears only about slightly larger than the planet Venus ap-pears to you as seen from the lineth. Therefore the Martian nights are not brilliantly illuminated by two large moons, as some writers would have you believe. To the contrary, the Martian night is very eauch like the percential night, except that Phobos when full appears to shed more light on Mars than the Moon sheds on Earth. For the Martian atmosphere is

considerably thinner than the terrestrial one, and for that reason it does not absorb so much light.†

"After circling around Mars at a height

"After circling around Mars at a height of 19,000 miles for some time, we finally decided to make a landing. By careful manesvering and switching of our antigravitational Marconium notting, we finally descended to a height of but five miles from the surface of Mars. On account of the otherless zone of the Marconium notting when switched on, we could, of course, not see what was beneath us at

iest thing we could possibly do was to substit ourselves entirely to the Marians' will. Indeed, we were so helpless that we could not have offered any resistance, evenhad we wanted to do so. We, therefore, calmly awaited developments, for we reasoned instinctively that we would not be hermed. Now were we mistaken in this view.

"The yellow rays auided the 'Interseliar' over a vast distance and at the end of an hour we were gently deposited on a lunge grassplot in a fairyland 'City.' The

instant that our dyer's broad landing belt touched the ground they yellow cays disappeared and immediately our normal facilities were restored once more. We were free to move and to art.

to act.

"We leet no time in unbolting our steel door, and in our anxiety toget cut in the open, all three of '2s, Elitternix, myself and Buster, our low terrier, almost tunified ever each other. I admit that on a histori-

cal racasion like this the first time in human being ant foot on another planet, we should have appeared more dignified as, for instance, Christopher Colorabias did when he first landed on San Salvador. Sad to selate, however, there was nothing dignified not solome to the occasion of our landing, and this was portly due to Buster. That infernal dog insisted on running between our feet and succeeded in tripping Plitternix just as he placed his foot on the ground; If it had not been for one he would have sprawled all over the

"It is a good thing that the Martians have a keen sense of humer, for the growd that had collected around our fiyer began to laugh appropriately in a queer, characteristic Martian falsette voice. I admit that we offered a sufficient cause for amustment, the professor in his old Prince Albert and myself attired in my costance of 1997. However, we quickly mastered to pull conselves together and we blinked around us in mucanomial sensement.

"Although the Mastian air is very much

"Although the Mastian air is very much thinner than the Earth's atmosphere, we experienced but little trouble in breathing for one stay in the ratified air of the Moonhad taught us how to breathe in thin air. We noticed immediately that the air wasvery pure and we did not cough oner, as was the case of our landing on the Moon-The Martian air seemed rich with econe, and we could not tid ourselves of the idea at first that we were breathing the strong air of a pine forest.

"But what held us spellbound for some minutes was the Martians themselves. I am not suse whether they were not as much amount as we were; for as we found our later, the Martian can conceal his emotions far better than the provefulal indian. While I was still staring at their nearest Martian with my mouth wide open. Fifteenix, who had recovered first from his surprise, hudged me and said: 'Didn't I tell you?'

"Only they did I amount

"Only shen did I remember our discourse of the previous day, when we were specialising together as to the probable appearance of the inhalitants of Mars. I remember new that Flitternix had said some-

thing like this:

"We have seen on Earth that animal lifer is possible under the most adverse conditions. We find life at the North Pole in the most awful cold, and we find life at

S Mars really inhabited by intelligent beings? Are conditions on this Planet such that life can be sustained on it? Some of the foremost thinkers in astronomical matters answer these questions in the affirmative.

The Spectral Analysis has revealed to us of what gases and matter the Sun is composed. By means of those pieroing instruments Logic and Deduction, we are enabled to tell what is going on on Mars. This story advances some new ideas on the subject and we have a bunch that you will enjoy this installment.

all times, for light does not pass through an otherless some. We therefore had only momentary glimpses of the planet during the short seconds when the current in the netting was switched off. This constant switching on and off of the current sedeced our speed to almost nothing, and we were thus slewly appreaching an open plain which we had picked our and which appeared like part of a desert, and probably samely enough to effect a soft landing of the 'Interstellart'. From our momentary glimpses we had become more than convicted that the planet must indeed be inhabitated by intelligent assenties of the mysterious long waterways and their attending strips of regetation, otherwise known as the Massian canals, and had also observed ponderous air craft by the thousand and curious structures near the canals that looked like gigantic pyramids. "Had we still doubted that Mass was in-

"Had we still doubted that Mars was inhabitated we were taught differently in a few minutes, for things began to happen partially."

rapidly.

"When we were still about two miles from the Planet's surface, suddenly as if by magic, everything before our eyes became yellow. At the same time a peculiar number-session came over our becides and we were hardly able to move hand or foot. Simultaneously the machinery of the 'Interstellar' became unmanageable, and looking through the lower portholes we could see that we were sapidly coming closes to the clanet's surface, at the same time moving in a socially different direction from the one we originally were bestling to.

"With some difficulty we managed to look up towards the top port windows and we may a marvelous eight. Three circular massive, what looked to us like metal aircraft, spaced equal distances apart, were fleating in space. The three flyers formed an equilateral triangle while in the exact center, but about one mile lower down that the flyers, our Interscellar was fleating. Three shafts of an intense yellow ray were turned on us and it was this light, or rather the peculiar properties of the rays which had made us captives to the Martians' suporior intelligence.

"We reasoned that these dealing fores must be used for defensive purposes on Mars, and we agreed among us that the

<sup>&</sup>quot;In order to disinguish facts from fiction in this installment, all statements containing actual scientific facts will be enclosed before a few I marks.—
Anomal.

the equator in the most intense heat. We find life in the thinnest mountain air, and we find life at the bottom of the ocean. Particularly the latter is interesting for even up to a few years ago scientists of note denied that a fairly large creature such as a fish could withstand the enor-mous pressure of water at the bottom of an ocean. For the scientists argued that the fish would be crushed to death by the thousands of tons of water above it. Not only that, but it was furthermore orgued that as it gets colder as one descends into the depths of the ocean the temperature finally drops below the freezing point of fresh water. How then could a fish live in such on absolet. It was simply impos-sible. The fish might just as well live in a frying san. The arguments were strong indeed against the possibility of life at the bottom of the sea.

†" "But then a man by name of Challenger

came along and invented a deep sea dredge. No somer had his expedition began to dredge than they fished from the bottom of the ocean the most astomoling specimen of deep sea fish built on a plan to with-stand enormous pressures. There, they were dead when they pressed at the surface of the ocean, but this was expected, for as soon as the enormous pressure to which the fish was accustomed was taken away, he naturally burst inside. So pur "wise" scientists with their heautiful logic were wrong once more and the impossible, as

adways, was very much possible? "I mention this only in passing, to show you that life can accustom itself to aiment any condition. There are indeed but few exceptions to this rule to my mind. Now, then, we have absolutely no right to be-lieve that the little planet Earth, among the billions of worlds, should be the only Sortunate one on which life thraves, therhenius has demonstrated already hew life is propagated from one planet to another. This famous philosopher has shown, that minute life carrying spores so small that they cannot be seen by the unked eye are carried through space pro-pelled by the pressure of the sun light till -they strike another heavenly body. If the accorditions are suitable the spore will go minate in time and life will spring up-if it is not there already—on that world. It has been proved that these spores can exist un an absolute ecro and in a perfect vacquinfor years, without losing their germina-tion power—another proof bow nature prodeers life under almost unbellevable con-ditions. Therefore to say that there is life only on the Earth is not only idlotic

the entrone, but it also reveals a total dack of appreciation of the wisdom of Admighty Nature.

"Now, then, it is an undisputable fact that plants, animals as well as humans, are entirely dependent upon their surroundings. If, for instance, you take an Eskimo and transplant him and his white on an island under the counter his white on an island under the equator, his white color will change into black in a few gen-erations. Likewise evolution shows that the human body very quickly adapts itself to the tasks imposed upon it. Thus a man whose grandfather and father were hurdworking laborers, will nine times out of den inherit a bony as well as robust body and a relatively small brain. Whereas a man whose grandfather and father were mathematicians nine times put of ten will have a comparatively small boned body, which is far from robust, but his brain

will be large.

"Surroundings are everything and given time they will transform upon or animal the different beings than they were original

inally. Now let us apply this reasoning to Mars and let to see what we will find. †To begin, it has been proved beyond dis-pute that Mars has an atmosphere, which although thinner than that of the Earth, is probably thick enough to sustain human life even as we know it. Professor Lowell has proved that the mean temperature on Mars is about 47 degs. Pahrenhelt, in some sections as, for instance, near the equator, the lamperstone can surely not he less than 65 degs. F. It was argued in former years that, on account of the far greater distance Mars is removed from the Sun than the Earth, the temperature must be ise below zero. Recent astronomical researches, however, completely the-proved this. As a matter of fact, Mars proper receives really more heat than does

#### pinide Chirenges is conducted as in a separation of a north pinion of a separation of a separa SYNOPSIS

1. M. Alier, an eccentric young scientist of Vanicana, blass, who chains as his ann many new as and as startling lawendiers, far about of anything as yet discovered, evans the largest trade-talephone plant in the country. One evening to bears strange somes, over his phones and immediately asputant, worse is beard. It is Munchington, one of the greatest yare and story tellers of all times. Munchington, one of the greatest yare and story tellers of all times. Munchington, and he fastlers are all times. Munchington, and he fastlers many gives ungulately ploof that his house it on the mean as preach.

After wants to hander, and he fastlers are the wants to have they Munchington, which has been explained how the water over the the Mine and explained how he want over the the Mine and explained in capturing Bertlin in a weighter have been exceeded in capturing Bertlin in a weighter in the Miner Hawever, it was not a complete exceeded, 35 the Barses left Earope for America. The immediately constances a second how to neutralize Gravity by means of Electricity, and he applies the invention to his spate fasce, the "Improvedier." The excellent process a exception, it responses and to life with tecourridges postel towards the space.

These things are discovered on the way to the Moste, among others that budies is to all their weight inside of the "Jargardelles" Finally a landing is reflected on the Moste in a decert. On side, bardally is encountered on necessary of the Moste particle atmosphers. The party then knows to the nearest arbunton range, where they discovered athereness they exister among the here are also discovered. Much based trees are also discovered. Much based next piece as world description of the Earth, Sun and the farmaneers be viewed from the Moster he discovered here the continuous and occurse of the Kanth appears the nonlinear and the farmaneers of the scattering of the Moster here are appears to the Moster here were appears to the Moster here were appeared to the Moster here. the firmament as viewed from the Materi he slive explains how the continents and occars of the Easth appear from the Meon. He then tells of the Easth appear from the Meon. He then tells of the pandetons measure which continently creat thewn on the Moon. Finally see [all down rear birs and the resulting contension hards Minishhausen in a homosphese Grater, which goes straight through the Moon. He falls clear through to the other site, but his momentum brings him back to the stating paint, where he is saved by his companion. They there decide is deput for the Plant Mate, but they have beind them on satisfaction with the plant, the "Easti Again, the flatter or the Mage, and thence to Alige. A popular letture on Mass is also given by Minishausen.

This course the home of the Minishausen.

These speak statum or the Mar imperial at the same North North well as sufficient at the same Postfale.

the Earth for the following reasons: The Martian atmosphere is neach thicear than the terrestrial, consequently the Sun's rays pieces it with far less loss than is the case on Barth. Then, too, there are no clouds on Mars to cut off almost 50 per cent. of the received Sun's rays, as is the actual case on Earth.

"Then again the Martian day is almost exactly as long as the terrestrial. Also due to the inclination of the Martian axis, which is almost exactly the same as the one of the Earth, the seasons are exactly like the terrestrial ones except that they are twice as long, because the Martian year is just twice as long as the terrestrial one.? "Now, then, we know that the planet

Mars, due to its small size, is a vastly older

world than the Exreb. Civilization on Mars must date back several hundred thou-sand years. The law of evolution teaches us that we must therefore expect a very cultured as well as accomplished race.

" 'As our terrestrial evolution above, the human head is growing larger and larger all the time. It must have been the same on Mars, for conditions here are almost the same as those on Earth. We must therefore, expect to find a race with enor-mous heads. As the pir is thinner on Mars sound will not carry as well as in a thicker atmosphere. We, therefore, with expect hig funnel-like cars on the Martinus to enable them to hear well. Itet a hig head almost invariably has big eyes; from this we may eafely deduce that the Martians have large eyes. But there is one important difference of physicial conditions on Mass, as compared with those on Earth, and that is gravitation. For what weighs one pound on Earth weight but 0.36 pound, or a fittle over one-third pound, on Mars-Less hodily weight makes for excessive growth for the reason that gravity palls less on the body frome. A little calculation based upon the above gravitational figures leads up to suspect that the over-age Martian should be about eight feet tall. As the stallight is very much stronger on account of the thin air on Mars, the Martian unless he is in the shade most of the time has probably a dark skin, which may be as red as that of a North American Indian or as dark as that of a West ไทน์(อส).

"Was the air is so thin on Mars and as oxygen is needed in large quantities for such big bodies as the Martians', we will not be surprised to find that the Martian has an immense torso, to accommodate his gonderous hungs. The latter must be doubly large in order to sustain such a large body and also to work over quickly the small percentage of exygen in the thin air. But large longs also invariably require a large nose, as we know from ex-perience, on earth. Consequently, if the perience, on earth. Consequently, if the Marrians have a ponderous nose, don't be surprised, for evolution shows us that animals breathe through their noses as a

rule.
"As to the Marsian's hands, it is probable we will find them rather small in proposition to the test of the body. Martians have probably advanced so far-that manual labor has been shollshed for bundreds of generations. It is almost certain that as everything must be done with machinery, manual labor is absolutely en-known to-day on Mars. This naturally, in the course of several thousand years, begins to tell and the hands must shrink. We will therefore expect that the eight-toot Martian has a hand rather smaller

foot Martian has a hand rather smaller than ours. Again, as no physical labor of any sort is performed by the Martian, his arms are probably thin and muscleless. "We to his feet, we shall find them to be very large in all probability. They must support a tall and rather heavy body, and they, therefore, must provide sufficient leverage to enable the Martian to walk properly. Not alone for the latter reason must the feet he later, but also on account of the feet be large, but also on account of Mars' small gravitational attraction; for if the Martian's feet were small, he could not secure the proper footbold to propel his body, he would be hopping instead of

walking.
"Therefore when we behold the first Marting we will probably find him to look totally different from a human being, and while my reasoning as to his probable appensance may be inaccurate in spots, I am sure that on the whole I will be correct."

"So spoke Flitternix. "He was right, marrelously right. His (Continued on page 371.)

#### Warfare of the Future

The Radium Destroyer

HE European Wor has clearly demonetrated what a tremendous past modean science plays in the offense as well as in the defense of the contending as meets. It has often been said during the past twelve months that this is not a war so much of men as of machines. Nothing could be truer. In fact, it might be said that this is a war of internal mathings against more dishelical madaines

It has been stated editorially in this journal that there will be war always, or gournal that there usil be war atways, or at least till we arrive at a period when some scientific genius (or shall be call, him devil?) invente a machine which at one stroke is capable of annihilating one or several army corps. When that time arrives, soldiers, no matter how cour-ageous, will think a long time before they will offer themselves to be shoughtened by will offer themselves to be slaughtered by

the hundred thousand.

In the meantime, probably for many gen-erations to come, the war death dance will go on without any doubt whatsocret. Humanity simply has not advanced to such a state where disarmament is possible. Our real civilization only dates back less than 100 years, and as human progress is extremely slow, it may take a thousand years and more before humans will learn how to trast each other implicitly. As long as we require policemen and julk to keep us out of misshiel, we are not able to take care of ourselves and we cannot call ourselves emancipated—we are still held in bondage by the brate in ourselves, which threatens to break out at any oppostude moment, as is witnessed in the present war.

Therefore, the pacificists, particularly those it; our country who think that this is the "last war" and who go around shouting peace at any price, are not only a sarry lot, but tacy are electfully oblivious of the teachings of history as well as of

human evelution.

These good people would shout munder if you dated suggest to them to dismiss at once all policemen and patrolines of their home town, but they would trust a strange matter implicitly from making war em this country, simply because that nation pledged itself on a plece of poper not to make war l

If the present war is ghostly with its poleon shells, its deadly chlorine gas, its bomb-throwing accoplance, its fire-spraying guas, its morderous machine guns, etc., what can we expect of the wars of the

What will happen when the scientists of a hundred years bence begin making war

on each other?

Suppose that by that time our scientists have solved the puzzle of the atom and have succeeded in liberating its prodigous forces. Irogging that at that time one atom con be disintegrated at will, instantly into another, what will happen? The results will simply be overwhelmingly astronding and almost incomprehensible to our present

It has been calculated that if we could liberate the latent energy at present lodged up in a cupper one coul piece we would be enabled to propel a train with 59 freight cars over a distance of 600 cales!

Now, then, bearing this in mind, let us imagine that IM years hence some scientist invents a means to unlock atomic forces, and how to control them. We can see aim stepping to the throne of his fitture Was Lord (if such still exist then), addressing him in this fashion; "My Lord, with the ongone of my invention the world is yours; will you make yourself the first Master of this Planet?"
The War Lord promptly asks for a se-

eret demonstration of the new "Aformic Gos," and what he sees interviews "I Gree," and what he sees intoxicates his imagination to such a degree that he decides to make war on the entire world as soon as his generals have assured him that emough atomic guns have been manufac-tured to make success portain. And end leautiful spring morning our War Lord linds a perfectly logical protest to make war on a few nations, and the latest war dance is on. Within a few hours the first atomic grass.

popularly known as the "Kadium De-strayer," has crossed the enemy's fronder. The Radium Destrayer is mounted on

fast moving auto tracks and is controlled entirely by Radio energy. No man is within a mile of the Destroyer—it is too dangerous to be near it when in action. A young lientenant with plumes clapped over his head and who follows the Destroyer in the "Control duto," and who gets his rown orders from the General Staff by Wiceless, guides each and every motion of the distant Radium Destroyer simply by mov-ing certain keys and awitches in front of

Soon his Destroyer has arrived in front of the enemy's first line of concreted steel trenches, protecting the land behind them. In front of the trenches the ground has been purposely out up to impede the progress of ordinary vehicles. The General Staff, of course, knew this, and built the Destroyer accordingly. Our friend the lieutenant stops the Destroyer's truck and moves a lever. Immediately the Destrever hops from the truck and begint to jump with surveing speed over the cutup ground, in grasshooper fashion. A few bundled feet from the well-concealed concrete trenches the Destroyer is made to halt. Our lieutement merces a few switches, turns a knot and presses a key— then fo! the inferna begins. A solid green "Rasimm-K" emanation cay bursts from the top of the Destroyer

and hits the concreted steel trench. Our front cover gives but a faint idea of what happens. The Radium-K emanation has the property of actions of spontaneously the cormans energy of the Atom of any element it encounters except lead. So when the ray hits the trench it went up in dust, concrete, steel, men and guns befind it, everything. After spraying the trench lengthwise for a few minutes it is gone completely. Only a dense cloud of vapor

hanging in the air remains.

The fleet of Radium Destroyers now enters through the gap, destroying everything in their path. No gun can bit the Exclima-Destroyer for ere the gun can get the proper range, the Radinor-K Ray has hit the gun or the ground below it and has sen; it up in vapor, including the men behind it. As a demonstration, the Com-manding General asks that the first town encountered, a city of 300,000 souls, be sacuted within three hours. The terrorized sacated within three hours. The teriorized inhabitants are forced to comply with the request, whereupon a dozen Destroyers ling up on the hills and spray the unjucky city with their isorful rays. Within five minutes the entire city, houses, churches, bridges, parks and excrypting else have gone up in a tituale Vappr cloud; only a sacater in the ground where the chainvas: crater in the ground where the thriving city one stood remains.

After this demonstration the enemy sues for peace; resistance would be folly. The country is conquered. Within a fuctnight the War Lord has conquesed the entire world and has proclaimed himself as

the First Planet Emperor.
What happens afterwards when the seered of the Radium Destroyer is discovered by the War Land's enemies is suother chapter, so we will design!

The above may read very funtacical and extremely function, it is, however, not only very possible but highly probable.

Modern Science knows not the word

Impossible.

ANENT WARLIKE INVENTIONS.

It is one of the aromalies of mariare that the machinery for fighting and lifting has been brought to its present ghastly perfection not by swashbuckling, bloodshirsty soldiers, but by the mild-mannered, peaceloving civilians, says the Review of Rehave exercised their ingeneity to heighten the terrors of battle, but theirs are tather aradenic improvements on the more daring contrivances of civilize precisanies and esgeneers.

Who gave us the turreted isomelad? Not who gave us the turneted indictad? Not a moral officer, but Brieson, a marine engineer. Who invested the machine gun, which squirts death every day on a dexeit European battlegrounds? Not a colonel of a captain, but Hiram Maxim, a brilliant American mechanic. Who gave the battle-ship its quick-acting gun-elevating mechanics? Not an engine of a commodore had elsm? Not an ensign or a commodore, but Janney, an American mechanical engineer. Who invented the motors for turning turwant Leonard, one of Edison's former Mark Leonard, one of Edison's former Mastants. Who planned the submarine? Not a Hull or a Nelson, but Robert Fulton, am perist.

So, one after another, the really impor-tant, the really epoch-making inventions comprising the mechanism of warfare prove to be the conceptions of remarkitally imaginuties but landbelike private citizens. Usually their contrivances are anything but perfect. They must be developed, and it to their development that the professinnal soldier has been most serviceable.

It is thus not only with the gues and at is take not only with the gain and submarines of war, but also with the telephones and electric lights of peace; for the investions that have made the United States and other countries commercially great same not from within given industries that from within given industries.

tries, but from without.

Always it is a dreamy plotter, an intrepid foer-lance, affance with enthusiasm, who enriches his country with a radically new labor-saving device or way of utilizing energy. Moste was a postrait painter when he first turned his attention to the when he has turned his anchor of deal engage, Boll was a teacher of deal enurs when he began his experiments with the telephone; Belson was a patentic of teleprophs and phonographs when he gave us the incandescent lamp; Marquei was a patentic of the incandescent lamp; niere lad with a liking for physics when he conducted his first successful experiments in wireless telegraphy.

With the single conspicuous exception of Edison not one of the inventors who have blaced new trails gave to the wind devicts that could be marketed at once. Development was necessary—development by less brilliant intellects identified with the In-dustries that were benefited.

WIRELESS ON CAPE COD. The United States News will establish a wireless station on Cape Cod especially equipped to guide vessels along the Atlantic coast in time of fog.

#### When the Lights Went Out on the "Bella."

By A. Troubleshooter.

UITE a few months ago, or, to be more exact, several years ago, the writer, who for the present most use the above nom de pluese, had some unique experiences in overharding the electric lighting equipment and generating plant of one of the ourserous humana boars which ply between the port of Philadelphia and the West Indies. Probably a few remi-niscences may be of interest in this direction, as the author had several quite outof the ordinary problems to contend with in endeavoring to fix up the electric light-ing equipment on this ship. She was built in England and answered to the name of "Bella."

It may be said to start with, and so that the reader will understand some of the problems encountered, that all of the wiring on this steamship consisted of a

traights artifered copper wire, which had but a very thin rubber insulation placed between the "central" copper conductor earrying the entrent and its outer spiral steel wire armor, The dynamo room was located amidships in a compartment of the nmin engine rocat, and from this point, where the switchboard was also located, the various circuit wires and cables were led out through holes out in the steel walls of the various composiments and decks to different locations about the ship. All of these lead wires and cables were armones, as afocementioned, and groups of them, containing often as many as 16 to 15 wires, were run along the steel hall of the boat or on the underside of the steel decks and subdocks, where they were firmly held in place by means of beavy brass clamps screwed fast to the steel

The "beautiful" job of chasing out a ground on one of these cirguits can be readily imagined, considering that auch grounds were so common on many of our visits to the steamship while she was in port that often 15 to 20 grounds would be encountered and have to be cleared up in a couple of days before the "good" ship sailed on its return voyage for more bananas and "grounds." Sometimes the whole group of

these wires would have to be released from their numerous clarps for a distance of 100 or 156 feet before the grounded wire itself would be finally separated and dis-

singuished from the others in the bunch. It was then, of course, replaced by now wire, and in some cases entirely new circuits were run in conduit or pipe. This vessel trarried a grant size searth-

light projector on the navigator's bridge above the plan house and was supplied with electric current through two large size stranded copper cables, which were rubber severed and also finished with a heavy braided outer coating. These cables were strapped onto the steel walls of the boat and comparements, and one of the largest size "grounds" ever seen in cap-tivity was presently discovered, and exist-

ing on one of these searchlight feeders.

The ground was trafed at the switch-board in the dynamo room with a magneto and, of course, no great trouble was thought to be in store for the "trouble-shooters," as it was thought possibly the cables had by electrolysis become grounded at some point along their course. But, le

and behold! when this cable was traced from the switchboard it followed the wall. of the engine room forward toward the front of the vessel and disappeared through a rigidly fitting bushing in the steel wall of the engine room. At this moment it was thought that by simply going up to the deck and re-entering the "hold" through the coal lumkers that this gable would be in sight again of course. We supposed it simply passed through a 56-inch steel wall only, but instead it passed directly through a steel "halk-haza" about 10 feet thick, and the only way to get inside that "bulkhead" was to cut a hole through the steel shell of same. If it had been possible or convenient at the time I suppose we trouble-shooters would have been at liberty to use an oxy-acetylene flame to cut a hole through the "bulk-head." This problem was finally cleated up by running a cable

"Electrical Trouble-Shooting on the Good Ship "Helm! Was

Somewhat Exciting, to Say the Least,"

up to the top of the engine room and along the deck, and so on up to the searchlight on the "bridge."

Moreover, this job was not only that of a trouble-shooting expedition, but also about 50 per cent, of the time was excepted in killing multifarious and multitudinous ocyriads of a heletogeneous med of "scorpious" and "centifiedes," some of which were large enough to fill a some plate. The greatest variety of poisonous "bugs" and other kindred enterests of this character that were ever encountered in the writer's experience were met with on this memorial trouble-shooting raid. All sizes and colors of spiders, from those as large as a Sc. piece up to those 45 foot in dismeter were frequently met with in one travels about the boat, especially at night, when we often explained the cavernous depths of her hold by the scintillating ithumination of a smoky coal-uil torch, which

manifested an exasporating habit of "ex-tinguishing" itself automatically about four times a minute, more or less; usually more-Thus it behooved us to carry a large sup-ply of matches in our pockets, as it was no small joke to be way down in one of the lower decies without a light or even a match at night, when about 5,000 rate used to hold pow-wows in the center of the Loor.

One of the most exciting explorations conducted on this steamship was about the steenth" visit we made to ber and which became necessary in order to repair the turn signal light, which was seened to the rail about the dock. In order to get at the wire supplying this stern light it was necessary to crowl into the sail and paint storeroom in the stern of the hoat, and which was packed full of canvas and other miscellaneous "limik" to within about 1½ feet

of the otiling, or rather, the under-side of the deck. The writer crawled it on top of these sails and whatnots in this instance for a dis-tance of about 40 feet. This hairraising and adventurous excursion. which was accomplished by wig-gling along on the stomach, was also accompanied by much sessur-lar exercise entailed by the necessity for manipulating one of those famous, torever smoking, coal-oil torebes in one hand, while in the other a five pound ball-pean hammer served to small not the life of about 499 regular sized (4 to 5 inch) bandy-egged spiders, and also several dozen 12-inch centipedes thrown in for a good measure. This may sound somewhat "tame," but when it is realized that a bite from one of these consipedes or spiders (which thrive, of course, primarily in the West Indies, where the bananas grow) means death in 10 minutes or less, it will be seen that this was "some" job.

When the inpubic-shooting "staff" first sackled this boat problem, with her numerous grounds and other complaints, they were, needless to say, some fall land-lubbers, and it very shortly became necessary for the rapid expedition of the "ork that they pick up the language of the ship, such as "for'd" and "ai't," and it was very tunny at times when some of the electricians would when some of the electricians would get an mixed up with the various locations of circuits about the ship that they did not know when asking one of the crew for information whether they were going in the right direction or not. The "staff" that unleavered to care for the "Rella's" directors and complaints baid a

"Bella's" diseases and complaints had a large variety of experiences before they got finished with the job, and some of these included being moisted up the main mast in a boatswain's chair, which con-sisted of a piece of planking with a rope seenred to some at either end and which was then fastened to a single rope passed shrough a tackle block at the top of the mast. One of the loss really got so used to this "bobbing up and down" on the main mast that he could always smell trouble a mile off, especially on a clear spring day, and emanating furtheritationly and only from one of the "signal" lamps at the reak of the mainthast,

To cap the clintax, and lengther the trimble-shooters had not finished up all of the circuit troubles on briand on one of (Continued on toge 37%)

## What the Housewife Should Know About Electricity.

By L. Shaw, Jr.

66 WANT to buy an electric fan," said the young woman with a sweet votes and smile that blended perfeetly.

The salesman was equally affable. With

a projunctation scalle reported:
"Yes, madem, "A. Clor 'D. C.?"

The radiant countenance changed as if by magic to one of peoplexity, which was plainty evident by the intended puschases nervously biting her lips.

The salesman's query resembled much the ever-mystifying technical phrases of

the family physician.

The lady in question realised that she should have been versued in the matter of hoging an electric san, but being probably the first one she had purchased, ac-

counted for ignorance on the rub-ject. However, it talks to mind our gleas and important fact: That since the use of electricity has entered into the bousehold something in a primary way should be learned about it. Ignorance or indifference may cause much annoyance and often

The average housewife has an in-sight as to the workings of her sewing machine and a general layman's knowledge about coal gas; then why not know a few simple imperative

things concerning electricity?
Automatically the second question arists: "What should the housewife know about electricity?" The incideet of the electric fan answers out query. The kind of carrent supplied to the boase, whether it is "alternating carrent" ("A. C.") or "direct current" ("D. C.") should be known. The next essential thing to know is

Taking chances is poor policy where electricity is involved. This was only two well realized by the woman who bought a 110-volt fatt and connected it to a 250-volt electric. The fireworks which resulted afforcied much suggement to the coil-dren and the maid who witnessed the display on a date that was no-where near the fourth of July, but the husband who paid for the fort dld not seem to think it such a funny incident.

Veltage and kind of current are inperative bits of information to one who would purchase any mating or electromechanical appliances, such as the former, an electric stove, percelator, said iron, soldering iron, or the ordinary Manda of earlier electric lamp. In heating devices the kind of current is not so essential as being versed as to voltage. The latter is important. In the second instance, while there are electric fans and vibrators which

COMPARATIVE COST OF CANDLE AND ELECTRIC LIGHT.

Engineers of the New York Editon Co. angueers of the New York addson Co-have recently concluded a series of tests showing the comparative costs between candle light and electric light. In spite of the fact that candles may be purchased as cheoply as a cent each, this is the most ex-pensive illuminant available.

One cent will furnish 2.68 candlepower-hours of candle light. For the same money and using the drawn-wire Maada lamps 120 camilepswer-bours may be obtained, while the recently perfected gas-filled lamp will give 1928 candlepower-hours.

The figures are the result of tests with

are "wound" to take either alternating or direct engrent, it is more common for such apparatus to be made to work on one or the other current. Knowledge of the voltage it absolutely essential in both instances

As it is probable that the reader of this magazine is of the more male see, the writer humbly suggests that his sudience make an earnest attempt to enlighten his mother, sister or wife (or intended spress) with a few sample, common facts about the general uses and application of the electric current common to the household.

In order to show how much enlighterment is necessary another case of no less import than already sited is recalled to the

The Lady From the Laterisine Cave Me an Imperating Order to Send "In Protocols Like Thron," Without Liven Think-ing of Voltage, and Disappeared Forthwith.

mind of the writer.
About two Xmastides ago, during the rush so common at that time of the year, a lady whose linuxume and livery which stood outside and general appearance be-spoke of money and culture, stepped to the counter where I happened to be assisting during the boliday rush and in apparent hurry picked me out and demanded in a very portpous manner that she wanted some "Christmas tree" lights (festoons).

six candles of the ordinary commercial types. Four were tallow and two were sperm. They wared from 48% inches to to 1.125 inches in length, and were from 0.75 to 1.125 inches thick. Three cost one cett each, two cost two cents each and one cost

35 couls. One of the one-cent ramiles burned 2 hours and 22 minutes, another burned 2 hours and 24 minutes, while the one-cent sperm candle lasted 3 hours and 47 minutes. The two-sent tallow candles lasted 4 hours and 24 minutes and 5 hours and 55 minutes, respectively. The 3.5-cent sperm candle lasted almost 9 hours. The cost of electricity was computed at 8 cents per kw.

Incidentally I had been demonstrating a large festures to a polar customer, lest they were of the battery type. I was unserewing the bulbs with the intention of replacing them into the box and laying them near by for the next customer. Without the least opportunity to make intelligent in-quiries as to the type of lights she wanted may lady, with the breezy ways, in a Napoleonic fashion pointed to the battery festoon to which I alluded, threw down an en-graved visiting eard, flew on: of the store and before I had time to realise it the limousing had disappeared. I obeyed her

imbusine and disappeared. I obeyed her commands, sending by special messenger 12 (eight-light) festoons. My only guide being the command and the dainfuly engraved card upon which was stribbled; "12 festoose" (wheever wrote it had found out at least that they were termed "festoon"), but had apparently forgotten to write the solitors and ly forgotten to write the voltage and left is to the discretion of the salesmen. Even the most intelligent discretion used is cometimes miscarried. In this instance it might have been that the lady wanted the battery type for her country home, where oil lamps were atlal in vogue. Or the might have desired to present them to a friend or relative not so fortunate as to have electricity in the

kroniše.

To make a long story short, the 12 hattery fractions were returned the day after Christmas, every lamp of which was completely housed out, accompanied by a cust note, triticising quite openly the fact that the writer was not a mind reader and solding insult to injury by demandlag a credit for the goods, also gent-ly reminding that the Yulctide in a Fifth avenue mansion was completely and wantenly obliterated. On lifth avenue, as might be known, 1:0 volt current is used. Merely as a matter of courtesy my firm adjusted her claim, although it can be charly seen that the brevry limensine lady was too kusy and indifferent to see that sile gave an order correctly. It is even more important, where a basty delivery is desired, to make sore that an order of this kind is

properly given.

The electric meter or the label on an emissary electric lamp will quickly determine the kind of current and its voltage. A few brief intelligent questions at time of purchase and studying printed matter, which often accompanies such purchase, will often obviate considerable inconveni-

ence and perhaps accidents—often fatal. So get busy Mr. Man and tell the women folks something about electricity. It may save you money.

#### MARCONI PLANS CONTROL OF AIR.

Wonderful stories are being whispered of a new Marcopi invention. It is declared the inventor of wireless telegraphy has found a way to willize Herrelan wayers in such manner that accoplance can be in such manner that assignment can be brought to a standard and field immerable in the sir. Experiments so the report goes, have been conducted with great severey until the invention is a been perfected and soon will be in use. The mind picture transmit of a linear ball stationary presented of air machines held stationary in the air while guns of the enemy below were shooting them to preses offers a new thrill of horror for followers of war news.

#### Something About Selenium

SELENIUM is one of the most purpling elements known to the scientific world, that to its extraordinary property of varying its electrical resistance when exposed to light. This phenomenon has been known for many years, but the commercial application of this property passessed by selemium has not been properly appreciated up to the present time.

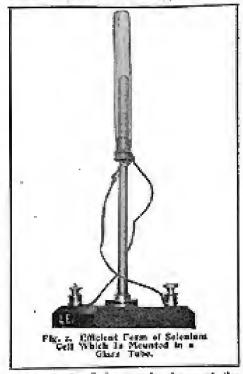
"selene" (moon); this being the result also of the striking similarity of the properties of selenium, with those of tellurium, which is a term derived from the Latin "tellus" (earth). It is a metallic element of the sulphur group and has neither taste nor smell. It melts at 212 degrees Centigrade, and if allowed to once rapidly from its molten state it forms a brown morrobous mass, and in this

morphous mass, and in this condition it is a high-class insulator; it is said that a small stick represents a resistance equivalent to a wire stretching for about 250,000 miles. The reddish vapor produced by boiling selenium, which has a decided smell of radishes, is exceedingly poisonous, and care should be taken when experimenting with it when it is in this boiling state. In commercial form, selenium exists in sticks resembling a gray sealing wax, and if it is be treed for making selenium cells it must be chemically torre.

Selenium cells are usually made by winding two bare conducting wires side by side around a piece of mice, state or porcelain and coating them with a thin layer of selenium. An excellent description of how such a cell is made is given in the Angust, 1914, issue of this journal. Such cells vary in resistance from 2,000 chms or more in the dark. This depends mainly upon the thickness of the selenium coating and the amount of light acting upon it; also upon the very important annealing of

Webb, Clausen and Bronck, Mescadier and Fritts.

The two cells to the extreme right and left are modifications of Shelford Bidwell's cells; the one in the upper left-hand

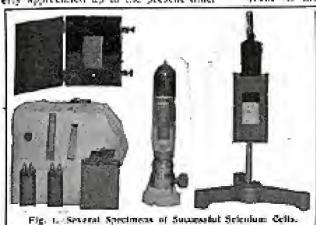


corner is the Rubmer take form of the Bidwell type. The one to the right is a Giltay cell. The four tiny ones shown

agalast the white background were made by her. Weld, which are also forms of Hidwell's cell, while the center one is of the Pritts gold-foil flat type, which is extremely sensitive. William J. Hammer has patented an exhansled cylindrical cell made of quartz, so as to allow the ultra-violet rays which will not sass shrough the glass to readily affect the selenium, which is coated over the sucface of a supper tube mounted on a central amprosts over the selenium is a thin tube of metal such as alte-minum foil, thin enough to allow light to pass through. The cop-per and aluminum connect to the twociccurcales.

A very sensitive selenium cell was enside by Samuel Cohen, and is illustrated in Fig. 2. It consists of a number of circular mostlic dire sensor.

ated by mica, and the sides are coated with a thin coat of setenium. The complete unit is placed in an exhausted place bulb



It is the purpose of the writer in proparing this article to make known the properties and enumerate some of the useful applications of attention, which undeubtedly will be valuable to the readers who are interested in scientific research, as there is a promising field for the use of this marvelous element.

This peauliar enhance, discovered in 1817 by Berzelius, an eminent Swedish scientist, is a by-product from the distillation of sulphuric acid from iron pyrites

AND GRADE TO AND G

Fig. 5 Echeme for Turning the and Off Street Lights by Means of Selection Cells, as Devised by William J. Hemmer.

(a sulphite of iron). The proximity of the earth and moon suggested to Besselius the name "Scienium," after the Greek the cell. In Fig. 1 is shown an illustration of a number of types of scientum cells, including the Bidwell, Ruhmer, Gliray,

as shown. A small concave mirror is placed behind the cell for concentrating the light at the rear of the selenium sur-

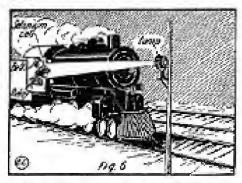
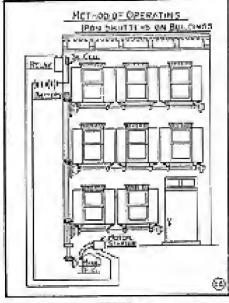


Fig. 1. Scientum Cell Applied to Safety Stop. for Railroad Teating.

Having thus briefly glanced over the properties of this element and certain types of nells, we are now ready to consider some of the commercial applications of the selenium cell, some of which already have

been worked out in actual practise.

Fig. 3 depicts the general connection of a seknium cell, buttery relay and its sec-opdary circuit. The selentum cell is connected in series with several cell batteries and a relay. As soon as the cell is placed in the dark its resistance is increased, consequently decreasing the current in the



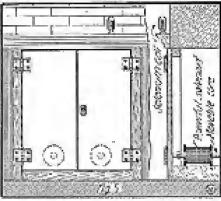
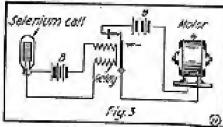


Fig. 5. Two Schemes for Opening and Classing Window Shutters at Sucritic and Susset by a Scientist Coll.

relay coils. The secondary circuit is therefore open, but as snou as some source of light is brought near the selenium the resistance drops, thereby allowing additional current to flow through the windings, which attracts the relay armatuse end in turn closes the secondary circuit. This is the fundamental directit of most devices which are operated by sclenium, and the principle holds the same as in this case.

A very interesting and practical application of this element is in the automatic lighting and extinguishing of stone lawge. Fig. 4 shows a schematic arrangement Fig. 1 shows a schematic arrangement, which has been actually demonstrated by William J. Hammer. This scheme he submitted in 1886 to the mayorithm of the Edison Association of Illuminating Companies at Rochester, N. Y., during a discussion upon "Metering Versus Contract Systems." Such a method of milliang actualism calls to control relevant and superselenium cells to control relays and magnets, which would turn off the gas lights



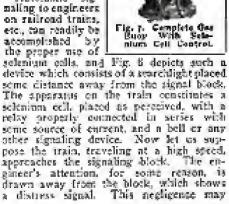
Standard Connections Cell and Relay. for Seinelweit

on the approach of the and turn them on again at night, would solve the problem of employing a squad of men necessary to

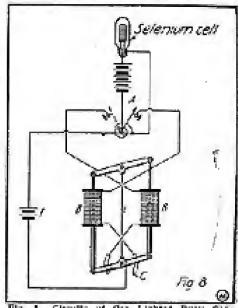
do this work at present.
Two other applications of selenium devised by the same inventor, similar to the device just described, are an automatic window shutter, illustrated in Fig. 5, that will close the shutters at night and seagen them in the morning automatically, and a

very striking use ot setensu; a ln the protection of safet, storage poome, étal, where the gelenium e e 11. is so placed in the reom that whoever enters with some illuminant will be detected by means of the cell. Thus, if a burglar should. estier the apartment the light from his lantern will be caught by the cell, which will actuate a bell sigmal, thus giving an alarm, enabling the police to surround the premises.

Automatic signaling to engineers on railroad trains, etc., can readily be accomplished. 37



gerhaps result in a tragic accident. On the other hand, let us suppose that such a device as above described were installed



Circuits of des Lighted Burg-trailed by Sun's Rays Affecting Scientum Coll.

on the train and a scarchlight placed about 600 yards before the block. Now, when the train passes this lamp it will immediately sause the selenium cell to close the relay, thus ringing the bell, which would be an annuuncement to the engineer that the signal block was being approached, Of course this particular scheme would benorth only nights. In this way some fatall accidents might be avoided. A more elaborate device was devised by Mr. Hammer, whereby a hell was rung, the whistle blown and the brakes set automatically when the semaphore and signal light showed that the line was blocked. His system is arranged to operate both night and day. A system of this makine is very practical and, if properly developed, will undoubtedly prove quite successful.

Still another practical application of the selenium cell has been made by the late Ernest Ruhmer, of Berlin, Germany, in

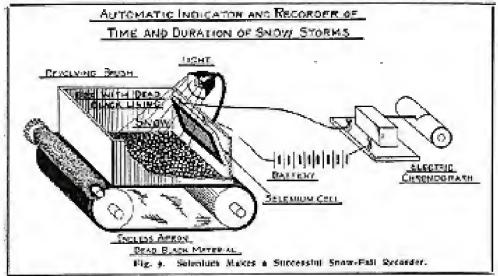
connection with a Pintsch gas truny. A large mumber of these have been beilt containing a supply of compressed gas which would last for one month. But it was necessary to burn these lights day and night, it belag ianpracticable by reason of the distance at which they were placed and the freguency of the storms, etc., to tuen of the gas so that it wenld not being during the day. Mr. Rubmer,



Fig. 46. Special Scientum Lett Bevite for Timber Pissbrycaphic Shalltais

bowever, placed one of his sclenium cells in the top of such a buoy, connected with a switching serious which as soon as the sun fires in the morning, exuses the selection to reduce its resistance, thus causing the mechanism to turn off the gas. It is again turned on, due to the increase of resistance of the

Prof. Barnard, of Lick University, employed experimentally a selenium cell as a device for automatically detecting



cell, by the approach of nightfall, or also. If so desired, in the case of darkness due to a storm or fog. A bucy containing sufficient gas for one month could thus be made to do actual acryice without reglarging from three to five mouths. Such a bucy is shown in Fig. 7. Mr. Rubmer told Mr. Hammer that upward of 100 of these buoys had been made and had given excellent satisfaction.

Excellent satisfaction.

The arrangement of the circuit, as originally devised by Mr. Rulmer, is shown in Fig. 3. The volumeter needle A has been replaced by the relay. B, B are two large "sucking" solenoids for operating the gat valve. A single dry battery is interpolated in the selenium cell circuit as usually employed. This battery will last for years and with its select is placed in the bottom. and, with its relay, is placed in the bottom of the buoy and arranged to be alsolutely waterproof.

Sir William Creokes has constructed an exceedingly interesting type of his wellknown radiometer, in which he has coated the revolving vanes on one side with selentum and on the other with chronic acid. He found that the white light from a sperm candle repelled the selections.

comets, and Minchin has employed the selection cell quite extensively in his astronomical investigations.

A very ingenious device, using this wonderful element for recording elec-

instrument for measuring time intervals. A small circular brush is placed near one end of the belt for removing the mow 25 the best is slowly revolved by the pulleys. The complete apparatus is placed outdoors with the exception of the recording device, which in this case is the chronograph. The drums are now started. As long as it shows, the snow upon the slowly moving belt will reflect the light produced by the electric bulb upon the selenium cell and in turn indicate on the chronograph, and as soon as it stops snowing the black surface of the belt absorbs the light, thready preor the bett absences the legal, average pre-venting the selenium cell from obtaining sufficient light; consequently it will not show upon the scale of the recording in-struments. Such a device is very practical, as it will show exactly and accurately the time when it snowed and how often it snewed during the night, it being a simple matter to keep the record during the daytime. At present there is available for the Weather Bureau only an instrument which measures the depth of the full of thow in a box protected from the wind to prevent drifting.

A very striking experiment has been performed with selenium by 5. Cohen in recording the speed of photographic shut-ters. The apparatus is shown in Fig. 10, and virtually consists of two selenium

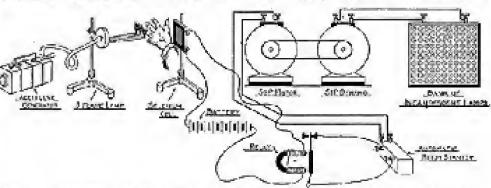


Fig. 11. Arrangement as Used by Wm. 3. Heramer for Controlling a 5 Heraepower Motor by a Wave of the Hand.

trically the amount of snowfall which ocselentum and on the other with elimentic curs during a certain period of time, was acid. He found that the white light from devised by Mr. Hammer and is illustrated a sperm candle repelled the selections, in Fig. 2. It consists of an endless black while the yellow light of the wax candle belt or conveyor, mounted on two reels cells, properly compensated with a Wheat-stone bridge and galvanometer, whose needle is placed upon a phronograph cylinder having a proper scale divided in frac-tions of a second. The operation of this device is as follows:

The Wheatstone bridge is very factly adjusted and a light from an incandescent electric lamp is placed near the shutter; the chronograph is started and the shutter is released. The small amount of light which passes through the shutter acts now upon the selenium cell, thereby reducing its resistance and in turn unbalancing the complete circuit. Momentarily, in turn, it deflects the galvenometer pointer. This is recorded upon the scale of the chronograph. The time is then read by the length of the line made by the needle. This device has been worked out in practice and it is another achievement in electric speed indicating devices.

Still another wonderful experiment was performed with the receipen cell by Mr. Hammer at the joint meeting of the american Institute of Electrical Engineers

American Institute of Electrical Engineers and the American Electrochemical Society. April 17, 1993. The amazing feat accomplished by him was starting and stopping a five-horsepower electric motor by a mere wave of his hand in front of a selenium cell. The apparatus used in this experiment is shown in Fig. 11. It consists of an acetylene generator supplying gas to a burner placed before the cell, as shown. The cell is connected with a relay

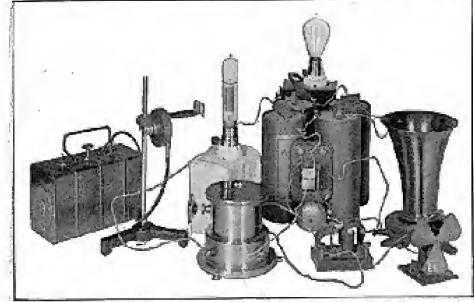


Fig. 12. Selection Cell and Austribury Apparatus for Laboratory and Lecture Demonstrations.

repelled the chrome, thus imflicating the relative absorptive powers of the different substances for rays of different refrangability quanting in mechanical motion. and forming the bottom of a box as de-pleted. A selenium cell is placed above this belt and is connected with a suitable battery and an electric chronograph, or

(Continued on page 373.)

### Wireless Telephony Now From Washington to Honolulu.

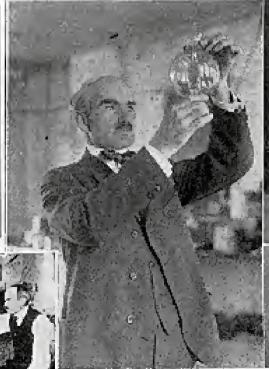
T HE most wonderful feas in wireless telephony was accomplished on the night of Sept. 29 last, when the human voice was projected through the ether from Washington, D. C. to Hone-lulu, a distance of 4,000 miles!

tary Daniels said:
"I am pleased to announce the successful dutceme of experiencests which have been chrifed on for the last few months by the American Telephone & Telegraph Company and the Western Blectric ComSignal Corps of the army, representatives of the sechnical and operating departments of the Navy Department and a few other

interested parties.

"After this successful demonstration, conversation originating in New York

From Lett Rights Dr. Lee de Forest in His Laboratory. Ur. de Forest Heiding One of this New Segenerative Audion Buths of the Type Used in 1,000 Mile Radiophine Talk. Top Right: Shows Mr. Theo. N. Vall. Talking From New York to San Proncises by Wireless (via Arlington). Buttum Right: Progression From Pirat de Forest Audion Detector at Right, to Latest Oscillation Tube Generatie of Lett.







Only a few hours earlier winders tele-

cony a few notes eather worders telephenic communication had been established
between New York City and San Francisco, a distance of 2500 miles, which was
herafded as an epochal innovation.

Secretary of the Navy Daniels had an
nagneed the successful transmission, of
wireless telephone messages from the
United States naval radio station at Marchinetor to the naval radio station at Marchinetor to the naval radio station at Marchinetor. lington to the eaval radio station at Mare Island, Cal., a distance of about 2,500 miles. All that was averaging to carry on this .

transcontinental wireless telephone conversation, he said, was to connect the operiver and transmitten apparathis of the special telephone outfit with the radio apparatus and send the

Captain W. H. G. Bullard, U. S. N., who is in charge of the Arlington station, and other officers of the navy conversed with officers of the many on duty at the Mare Island yard in San Francisco.

The demonstration was the result or experiments that bave been in progress for some time, and their success is expected to have a revolu-tionary influence on second-disting between American naval vessels and shore stations. By means of this perfected apparents, which probably will be installed at all rayal melle stations, it is expected that officers of the navy on land will be able to earry on wireless telephone conversation with officers at san. Captain Wellard stated that the apparatus

had been perfected to the point where a person on shore might earry on a long distance wiseless telephone conversation with a friend on a transationhe lines in mid-ecean, whenever shore station and lines were equipped with the necessary apparatus. In his formal amountement, Secrepany in co-operation with radio stations under the jurisdiction of the Navy Department by which long-distance wireless tele-

phony has been made possible.

Speech has been successfully trainmitted from the Ashington radio station to matted from the Asimgnon radio station to the radio station as Mare Island, Cal., and there successfully received, thus making possible conversation without wires over a distance of approximately 2,500 miles, the first time this great distance has been covered by wireless telephony. first experiments the voice was success-

garienelegennic Bange Chart, Snowing How Speech Was Plang Terrough the Ether, 2000 Miles From Washington to Henotulu, Corresponding to Distance Between Scattle

fully transmitted by radio to Mare Island iran Arlington, the return answers and communication being made over the trans-confirmal land telephone line. This was successfully accomplished in the presence of officials and engineers of the Western Electric Company, a representative of the

City was transmitted over the land wire to Arlington, there automatically connected to the radio transmitter which carried the roice to Mare Island, where it was clearly and distinctly received, and answers and other conversation were from these transnested over the transcontinental line to the originating office in New York.

The conversation was carried on by the president of the American Telephone & Telegraph Company, Mr. Vail: the vice-president, Mr. Bethell, and Mr. Waterbury, one of the directors, while at Mare Island neare efficiency of the Nam December.

were efficiels of the Newy Department, John J. Carty, chief engineer of the American Telephone & Telegraph Company, and representatives of the Western Effective Company.

Every official taking part in this

demonstration is enthusiastic about the results and the possibility of deresults and the possibility of developing this system as an extension of the telephone system to ships at sea. The fact that the voices can be started on a land wise and automatically transmitted to a voice radio transmitter fields out hope that persous should readily he put in touch by telephone with officers at sea through some central transmitting staffget.

"The use of such long distance wireless talephone communications in naval or military operations is still in an undeveloped state, but it is expected valuable use can be made of the wenderful demonstration; but

aside from such considerations the department and its officials feel proud that they have been interested co-operators in the first practical development of this last march in the wonderful science of radio communication."

The space through which the grai mos-(Continued on page 30%)

## Photographing Sound Waves Electrically

By Robert H. Moulton

The man who has had his troubles plantographing an automobile traveling at the rate of 70 milm an hour, or about 100 feet rate of 70 miles an nour, or about he see a second, will best appreciate the difficul-ties faced by Prof. Albert F. Foley, of the University of Indiana, when he attempted to photograph a "sound wave." Yet From lessor Foley sweensfully accomplished the last the polytic in pages 162 plantage wave. feat and, what is more, his platters were sharp and clear, which is something that cannot be said of most photographs of

automobiles going at full speed.

To emphasize the greater obstacles overcome by his methods, it may be stated that photographs of racing automobiles are usually taken at a distance of 60 feet or more and the ears, of course, may be plainly seen, while the objects photographed by this scientist were only 2 feet away from the camera and are moreover invisible to

the naked eye.

His method of photographing sound waves was suggested by the "twinkling" light of the stars, a phenomena caused by the light possing through air layers of varying density, due to varying tempera-ture; in reality the light of the stars is absolutely constant. In like manner sound waves in his are waves of condensation

this disaker must not last longer than over-religionth of a second. Moreover, while the light these last, it must be a thousand times as strong as the light ordinarily employed in taking a photograph with a camera whose shotter works at a spend of en-changement of a second, and it must be terroid for at creatly the right time or the turned on at exocity the right time or the sound wave will be out of range of the

photographic place.

Professor boley arranged a large electrical machine capable of profinding an almost continuous stream of electric sparks a foot or more in length, and each of such energy that is caused a load report. In the elecule through which the sparks were to pass he made two sperk gags or breaks and in front of the first gap, mearest the chetrical machine, placed his camera containing the photographic place.

The action that results when a sourk passes through the circuit may be described as follows: At the first sap the spork generales a sound mave directly in front of

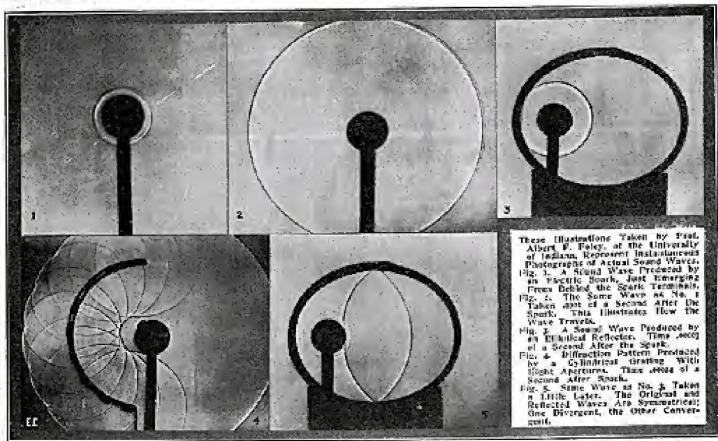
the photographic plate.

the time that the sound wave has traveled outwards a few continueters from the source the second or illuminating spark occurs at the second gap. The light

which show the waves in the process of being reflected from plane and curved mir-rors, being brought to a forms by convex

roes, being brought to a focus by convex kns and made divergent by concave lenses, and, in fact, doing exerything demanded by the sound wave is produced by an electric spark gap S, which will be called the sound gap. The light is produced by a second spark at the illuminator gap L which will be called the light gap. If the sparks at 1 and S are simultaneous the light I passes S before the sound wave concages from behind the spark terminals. calenges from behind the spork terminals. If the time interval between the sparks is any considerable fraction of a second the sound wave at S passes out of the field before the light from I reaches S. But when the interval between the two sparks is properly timed the sound wave at S easts its similar on the photographic dry

plate C.
The spark gaps S and I are connected in series to the spark knobs K, Ka, which receive sparks from T, To, the terminals of a large electric induction muchine having four rotating in ca plates 20 inches in diameter, driven by a variable-speed electrie motor. The length of the spack gaps



and gefraction—that is, series of regions of varying air density. Since, then, the light from a star will be bent from its straight line path when it passes through such re-gion, Professor Foley researed that sound waves produced between a point source and a produced between the shadows on the place. The only many processary

then is to photograph this shadow. While this sounds simple and easy conagh, it must be remembered that a sound wave travels at such great speed (or 1,125,00 fort per second at 20 dag. Centigrade) that in order to secure a slump image of its shadow the light illuminating

from this spack is refracted be it passes the sound have on its way to the photo-graphic plate, thus throwing a sindow of the sound wave on the place. To make the light of the illuminating spark suffigiently intense to give a ofear image on the place the electric charge is first stored in a large capacity of Leyden jars charged to a high potential, and then discharged between magnes um tecminals placed in a glass tube like a short our barrel, to direct the light, toward the plate. The details of

this process are given below.

This physicist has a remarkable collection of these seared wave photographs.

T-K and Ta-Ka is adjusted by sliding T and Ta horizontally, or by moving K and K, vertically. Gives plates G and Ga, about the continuous square, are fastened to a weoden bar on rod R, arranged so that it can be retated on a horizontal axis. In the position shown in the figure the plates are directly between the spark knobs T and K and T and K, thus preventing a spark. A quarter turn of the handle red R comoves the plates and allows the spark. to pass. In practice, however, it was found best to make the spark gaps T-K and T.-K. just long enough to prevent sparking when the glass plates are out of the held.

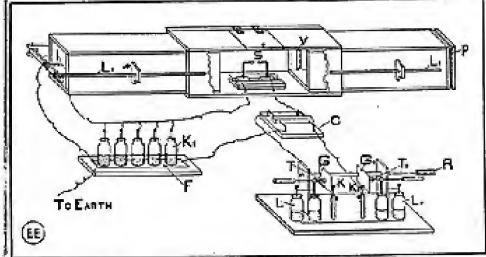
Rotating the sad then causes a spark just as the edges of the plates pass through

the gaps. To get a strong sound wave at 5 and an intense light at I, the spacks to the knobs K, K, should be heavy; consequently from one to three Leyden jars L. L. are put in multiple with each of the jury on

the machine itself. Most of the work is done with one additional jur connected so each of the machine jers.

The knobs K. K. are connected to the gaps. S and I through a large commutator C. Thus the direction of the spark as the gaps is readily changed. It was found that the apparatus worked about equally well with the spark in either direction. The chief effect of reversing the spark direction appeared to be a slight change in the time intervals of the sound and light "sparks."

The sound gap S is in series with the light gap I, nevertheless the spark at S manus before the one at I, because of the capacity K, which is in multiple with the gap I, as alsown in the figure. The ca-pacity K, consists of from two to eight Leydon javy of the usual type standing bu-



Leyout of Apparatus Used by Pret, Polcy in Photographing Sound Wares.

a sheet of sinfell F, with one coating con-nected to earth. The time interval between the sound and light sparks depends on the capacity Ke, the greater the capacity the greater the interval. However, a is not at all necessary to have here a variable condenses or one made up of small units. One can vary the capacity Ka between rather large limits

and still knep the proper time interval by varying the cirquit in other ways. he time interval is increased by decreasing the capac-ity L, L<sub>e</sub>; by de-creasing the length of the spark gaps T-K and T<sub>2</sub>-K<sub>6</sub>. One can rang the capac-ity K by 100 per cent and readily maintain an approxiimately' constant time interval between the sound and light sparks by merely changing the length of the light gap. The length of this gap is adjusted by the lever arrangement L. La

#### NAMES VISERS NAVAL DANIELS

The make up of the Naval Advisory Board of Inventions, the organization of experts who will contribute their inventive genius to the navy, of which Thomas A. Edison is to be the chairman, was an-nounced by Josephus Daniels, the Sceretary of the Navy, on Sept. 12 last.

The board will consist of 23 members, including Mr. Edison, who was addeted by Mr. Daniels to serve as the presiding officer of the board.

The other 22 members of the board, who were chosen by belief by II of the principal scientific societies of the country whose members deal with those branches of science on which the may is thought to be dependent for invention, are: W. R. Whitney, L. H. Backelaid, Frank

W. R. Whitney, L. H. Backeland, Frank Julian Sprague, Benjamin G. Lomme, R. S. Woodward, Arthur Gordon Weleter, A. M. Hant, Alfred Crawen, Spencer Miller, William Le Roy Emmer, Matthew B. Sellers, Hadson Maxim, Peter Cooper Hewitz, Thomas Robbins, Howard E. Caffin, Andrew J. Riker, Henry A. Wise Wood, Elmer A. Sperry, William L. Sannders, Benjamin B. Thayer, J. W. Richards and Lawrence Addicks.

The first general meeting of the bond

The first general meeting of the hoard was called on Wednesday, Oct. 6, in the office of Secretary Danielo in Washington. In autouncing the names of the members

of the board Secretary Daniels made the

following statement:

Desirate to make available the latent inventive genius of our country to improve our pavy, a shore while ago I requested Mr. Thomas A. Edison to become chairmon of an advisory board of eminont men who would make up the board. Mr. Edison, with the patriotism characteristic of American inventors, accepted the call to duty. The plan adopted for selecting the members of the advisory board was as follows:

"I requested 11 great engineering and scientific societies to select by popular election two members to represent their society on the board. The result has been most on the board. The result has been most gratifying. I have received the nomina-tions of all these societies and have accepted them, and it only remains to have & meeting, organize and determine the method of procedure in order to utilize to the best. advantage of our many this mobilization of the talent and genius of our country. The response of the maisties invited to co-operate in the great undertaking indicates the pareletic enthusiasm awakened by this call to duty."

Personnel of the Board.

These are the members selected by the societies and accepted by the Secretary's

American Chemical Society - W. R. Whitney, Scheneerady, N. V.; Massachusetta Institute of Tertmology, '90; director of research the borstory of the General Electric Co., where he has been the moving spirit in the perfection of metallic electric lamp filmsects and the decidence. filaments and the development of wrought tangetens. L. H. Barkeland, Yorkers, N. Y.; University of Ghest, '82; in private practice; founder of the Nopera Chemical Co., 1892, and inventor of photographic

American Institute of Electrical Engl-neers—Frank Julian Sprague, New York City: Naval Associaty, '78; consulting en-gineer for Sprague, Otis and Guteral Elecgiver in sprages, this aim outers therefore companies; founder of the Sprague Bleerle Railway Motor Ca. and concerned in establishing arat electric teolley systems in the United States. R. G. Linemer, Pittsburgh. Ohio State, 88; chief engineer of Westinghouse Electric and Manufacturing Co. and a prolific inventor.

American Mathematical Society—Robert

Simpson Woodward, Washington, D. C.; Michigan, 72; president of Carnegie Institution and an authority on accommy, geography and mathematical physics. Asthus Gordon Webster, Worcester, Mass.; Harvard, '85; professor of physics of Clark University and an authority on sound, its production and measurement.

American Society of Civil Engineers— Andrew Murray Hunt, New York Civy: Naval Academy, "70; consulting engineer; experienced in the development of hydroelectric, steam and gas plants. Alfred Crnven, New York Chy; Naval Academy, 67; whiel rugateer of Public Service Commission and formerly division engineer in charge of construction work on Croton Aqueduct and reservoirs.

American Aeronautical Society-Matthew Bason Sellers, Baltimore, Md.; Law-rence Scientific School; director of Tech-nical Board of the Aeronautical Society of America, and first to determine dynamic wind presente on arched surfaces by means of "wind found," Hudson Maxim, Brooklyn, N. Y.; ordnanec and explosive expert and makes of first smokeless powder adopt-

ed by the United States Government.
The Inventors Guild-Petri Cooper Hearing New York City; inventor of elec-tric lamp appliances to enable direct cursent apparatus to be used with alternating current circuits, and devices for telephones and aircraft. Thomas Robbins, Stamford, Come; Pelaceron; president of Robbins Conveying Bell Co. and inventor of many devices for conveying cost and ore

devices for conveying coal and one.

American Society of Automobile Engineers—Andrew L. Raker, Demoit; vice-president of the Locomobile Co.; electrical and mechanical engineer and investor of many automobile devices. Howard E. Coffin, Detroit; Michigan, '96; vice-president of the Hudsen Motor Car Co, and active in the development of internal combestion engineer.

American Institute of Mining Engineers
—William Laurence Saunders, New York
City; Pennsylvania, 70; idialrana board
of directors of the Ingersell-Eand Co. and inventor of many devices for subaqueous and rock drilling. Benjamin Bowdisch Thayer, New York City; Harvard, 35; president of the Anneonda Copper Mining Benjamin Bowditch Co. and an authority on explosives. Autoriest, Electro Chemical Society

seph William Richards, South Beth cheur, Po.; Lehigh, 'ell: professor of electro chem-istry, Lehigh University, and author of humerous works on electro metallurgy. Lawrence Addicks, Clerome, N. J.; Massachusetts Institute of Technology, '89; consulting engineer for Phelys, Dudge & Ca. and an authority on the metallurgy of cop-

American Society of Mechanical Engineers-William Lercy Entmet, Scheneticity, N. Y.; Naval Academy, '81; engineer with the General Electric Co.; designed and directed the development of the Curtis turbine; first serious promoter of electric propulsion for ships. Spencer Miller, South Orange, N. J.; Worcester Polytechnic, 79; inventor of ship coaling apparatus and the breeches know device used in resques from ališji w recks.

(Consinued on June 2014.)

erating tube itself, which becomes ex-tremely hot when operated for periods of several minutes or even seconds; this is

eatinly due to the rapid innie bembardatent acting on the Anode electrode. Various

shapes and sizes of Anodes and tubes were

#### Some New X-Ray Apparatus

S EVERAL new X-ray apparatus have been recently developed and perfected whereby the efficiency of this electrical aid to surgery and medical acenhas been vastly increased. A number of these up-to-date X-ray apparatus will be described in this article.

One great difficulty in the generation of high voltage currents by an industrian coil



os transformer for X-ray requirements lits in the device which produces the current interruptions when operated on direct ourrent. Various types of interrupters have been built for this purpose, but none of them have proved very efficient. One of inating gas for a quenching dielectric is depicted in Fig. 1. This particular inter-rupter consists of a small rotary pump, which throws a stream of metallic mettury against contact segments. The are which is formed upon the break at the

contacts is quenched by the gas, which is sent through the chamber. A condensur, of snitable capacmy, is shouted across the interrupter terminals. The number of betake per second can be regulated by varying the speed of the motor. and also by the adjustment existent between the rotary and session-

My segment. A highly efficient MANY CHITCH! chemical transformer (really as electrolytic Secoltier) is portrayed at Fig. 2. This conspirates an ordimany receiver of this class, employ-ing extra large iron and aleminum planes intersect in au elegtrolyte of sodium phosphale (or bicarlamate of

acda may be used). These chamical mans formers (an is satisfactorily employed in places where direct current is required. when A. C. is supplied from power com-

panies' mains. These large restifiers. are in wested in the primary circuit of large (3-5 km) X-ray transormers to clip off half the cycle waves of the alternating current and thus produce in the secondary circuit a unidirectional or direct current of high potential. In other words. the negative pulses of current in the primary circuit are clipped of: by there eat i have and pulses of positive current only are allowed to pass through the transformer. This does not give a true unidirectional on D. C. in the secondary, but by interposing high potential rectifier tubes in the secondary gitetiit before the entries to reaches the X-ray take the annel-desired high tension direct culte energial mately developed. In the Parze machines page direct current as 190,000 velts is pro-duced by a revolving commutator of special

Pic. 5. Election-Static Type of X-Ray, Penginameter,

In this way the Anode is constantly cooled by the circulating figuid. This scheme has showed remarkable results in allowing the tube to be manipulated for several minutes,

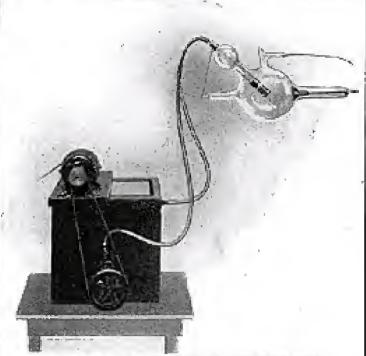


Fig. 3. Weter Cooking Apparatus for Large X-Ray Tubes.

di Silve

made to help climinate this defect, but

more of them have proven very beneficial, until the water-coaled Anode tube was devised. This is illustrated in Fig. 3, to-

gether with its water circulating appar-atus. This consists of an electrically-

driven pump boilt into a large water tank,

to which two rather takes are connected from the tube, one for feeding in the

water and the other for discharging it,

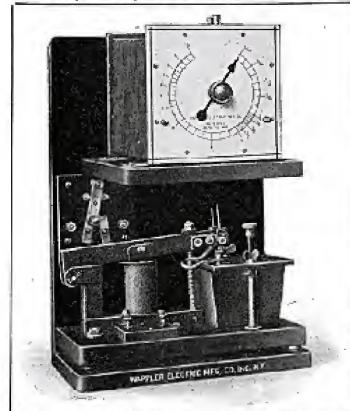


Fig. 8. Seriel These With Heavy Carrent Switch for NoRny Work.

the latest interrupters of the improved cueroncy jet type and which employs illum-

design. Another problem met with in the con-tinuous production of X-rays is the genat full load, which often means 15 to 25

A repent very next instrument has been

designed whereav the penetration of the Xrays through silver is taken it is well known that these cays do not penerate this stem uppreciably and conse-quently a "mener" (or nagarating the presenttion of X-rays has been invenient. It is also yo in Fig. 1, and is called technically a "Penesno-meter." This instrumeter." consists of a 1711214 standardized tapesed plene of silver, mounted on a lever which is rescable in front of a Buoresegue streen by means of a rack and pinion oper-ated by a small knob in front of the instrameet. A small graduated aluminum scale is provided at as to show. exactly the penetration of the particular X-ray measured. The distance between the luber to be tested and the Penetromater, at which readngs are taken, is mmaterial, as the radiance at a given distance has an even influence through the silver and aluminam; bowever, as a sule 12 enches from the well of the tube allows the quickest readings. Aninensuring the promotesting pener of the rays is depicted in Fig. 5, out this is graduated in different units and is operated by a single wire, consecred to the cathode terminal of the high tension machine, This is a different i.estrument than the one previously described, as

the former depends upon the secondary voltage produced by the transformer. In assumed as the penetrating power of the tabe depends upon the voltage, this instru-

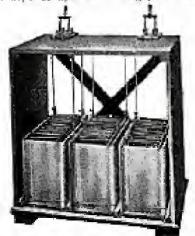
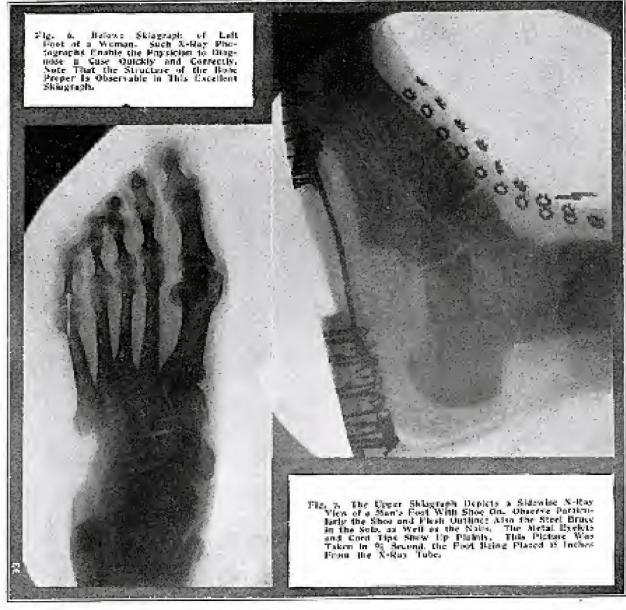


Fig. 2. Chemical Rectifier Capable Handling Several Kilometts.

ment will show exactly the penetration of any particular X-ray tube. We present two exceptionally good

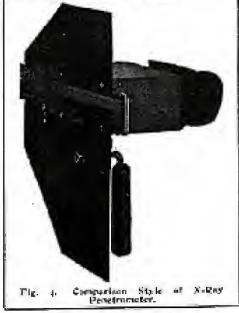
skiagraplic pictures which have been taleen with different X-ray tubes. Fig. 6 shows the bare foot of a woman. Note the wonclosing the circuit through the transformer. At the expiration of the predetermined length of time the first circuit breaks, the



derful clearness of the bonce and the foreus structure of same; while Fig. 7. portrays X-ray photo of the right foot of a man, with sline on, as will be readily per-ceived. Note the appearance of the assoof the foot in comparison with the leather of the sleet. Also observe the mills, the arch, lace tipt and cyclets. This picture was taken with a 34 second exposure; distance between take and plate was 18 inches, while the tube was carrying W millinguperes of high potential direct correct The latter skingraph was taken by Harry P. Ergest, the expert radiographet of the Kny-Scherer Co.

The illustration at Fig. 8 is of a new X-Ray serial timer, which will be found very useful to the medical profession cugaged in making unmersely skingraphs. The timing of such X-Ray photos is very important. The dial indicator of this new instruction may be placed on any exposure time from 1/60 of a second to 10 seconds.

The Repeating Serial Times is made up of an arthaning mechanism which permits a gair of contacts to close an electric city quit through a magnet, and remain closed for a predetermined length of time, this being accomplished by the magnet pulling a pair of large contact surfaces together. magnetism collapses and the large mutacts



are separated by a strong spiral spring

#### READING ELECTRIC METERS WITH A CAMERA

The truth-celling convers has found another and highly practical field of macfulness. Electric meters, gas and water maters will in future be photographed in-

stead of read and and in place of figures furnished by sometimes very fallible inspectors a film record will augily authentic confirmation of the charge. This method of reading will also be much quicker and, with all possibility of error removed, a great saving in the time of suspectors and clorks as well as of consumers over disputed accounts will be effected.

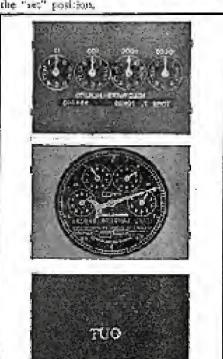
A camera for the purpose has just been invented by the East-man Kodak Co., and is known as fig "Factograph." This no vel camera is obling in shape, measuring 425 × 5% × 12% inches—is made is an adjusted mahogany, is compared with a high grade amostignate lens working at 6.65 and a simple automatic shunter pennsitting exposures varying from 1/5 to 35 m second—within the judgment of the operator.

The namera is made in two

The mmera is made in two mompartments—the forward compartment being an electrically lighted chamber with an opening that his over the meter dist. The reading is nucle by simply placing this opening against the meet and pressure downward on the exposure lever.

This one notion automatically turns on the light, opens and closes the shutter and turns off the light. The shutter with each exposure locks automatically and remains locked until film for the

next exposure has been wound into place, when it again flies automatically back to the "set" position.



This prevents the possibility of a double exposure—likewise there can be no blanks,

Sample of Film Record as Taken by New Backele Meter Comera.

for the film eannet be wound off until the exposure is made. Whitling reel and shutter are automatically unlocked. This eliminates the possibility of error from forgetting to turn the key or from turning the key before the exposure is made. The light



How the New Electrically Lighted Meter-Reading Comera is Used.

is farmished from two four-cell dry harteries stored on either side of the camera and supplying current to four 3.8 volt Tungsten minishme hoops.

The exposure is recorded upon special, sensitized papers a special film or paper as supplied in the familiar cartridge form and is dividigle loading each carriedge careying to exposures.

Storage space for two extra rolls is provided in the dark character of the camera in addition to the roll in position, permitting 220 readings to be carried within the body of the camera. A small drawer is position in front which carries aix extra lamps.

By pressing a small lutton which is located just below the exposure lever the lights may be incord on and the camera converted into a "flasher" for locating meters or finding one's way through dark cellars.

Special developer, surnished for the purpose, makes it possible to develop the film in 45 seconds. It is then ready for the reading by the bill clerk. No printing is necessary. The speeds of film are apposed to a they answer metal up like a movie files, the clerk copying the records as they are mirrored. Identification of each under is made possible by extracting the name and number to the meter. These are globographed with the meter reading.

In residence sections, through absence of the household, inspectors are frequently unable to gain access to the meters on the first call. For each contingencies cards are provided with the word "out" printed upon them. This card is photographed in place of the meter record and the information appears on the film in its proper order.

#### MISHAPS ATTEND USE OF WIRE-LESS ON AEROPLANES.

It has already been noted in many official and modificial despatches that wireless telegraphy is frequently used both by the Royal Flying Corps and the Royal Naval.

Air Service. Most people are

Air Service. Most people are used to seeing wireless apparatus, which, whether used on board ship or on land, includes a series of long whee strong between masts or attached to a long pole in the ground.

These generally take the form of a simple long wire on acroplanes, which, when not in use, is wound up on a reel like the real of a fishing rod, inside the machine. When it is intended to operate the apparatus the aerisl is let out, the initial impotest being given to it by a lead weight like a plumb bob attached to the end.

Several hundred feet of this wire one let out, and it assumes a most curious shape in the air, because the weight of the plants bound of the lower portion of the wire naturally endeavors to hang three straight, whereas the resurance of the air through which the areal is dragged always tries to pull it out horizontally behind the machine, with the result that the wire assumes a curve stratching out some distance beaind the machine track, says the editor of The Accordence, London.

When several hundred feet of wire are our, the air resistance actually amounts to quite a considerable steam on the reci, and consequently on the machine haelf, though it is generally attacked to that it does not interfere to any considerable degree with the fore and aft or lateral control of the

machine. If, however, the engage stops suddenly, and the pilet has to make a forced descent, his operations are occasionally complicated by the maistance of the wire, which then is not to act something like a brake on the machine's gliding path downward, unless it can be wound up fairly quickly.

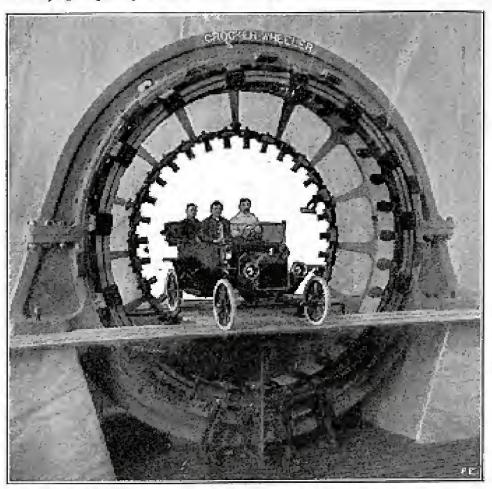
In one case an officer who was experimenting with wirefess as a possesser on a machine so litted was quite badly knocked about owing to the necessity for winding in the wire. He was quite an experienced flyer, and had made a study of the best way to behave in case of an abdicant. In several such cases he had some out unbust by the simple property of tucking his feet up onto the seat and rolling hisself up as meanly into the shape of a half as possible, so that when the machine turned head over were not trapped by the front part of the machine breaking lack on top of them.

In this particular instance he was so full of his duty that he went on winding away of the regl fill the machine actually strock the ground. He had been obliged to steady himself with one foot against the floor of the front of the machine and wind up the goel on the left-hand side of the machine with his right hand. Consequently when the machine struck he pitched with all his weight onto his foot and was flung forward. with his right arm against the front of the bodywork, the resulting damage being a broken leg and a broken arm. He has shoen concluded that under similar circumstances it is wisee to let the wire alone when he is near the ground and hope that it will take in a tree or a bedge and break.

## MASSIVE ELECTRIC GENERATOR HOLDS AUTOMOBILE.

The illustration shown herewith depicts an extra large electric dynamo built for one of the great automobile factories in Detroit. The massive size of this dynamo can be judged by the picture, which illus-

crates one of this concern's automobiles testing teachy on a scallold in the center of the stationary field frame of the generator. This is one of several similar generators which will supply the current for the entire plant turning out these motor of 3.



Huge Riccirle Generales Asymmetodates Automobile Within Its l'ield Prame.

MIND-READING DOG IS A PUZZLE

TO SCIENTISTS.

DECLARED by Western scientists to be one of the most remarkable dogs on record, Hector, a little Freight poolds, owned by C. J. Tryon, a mining engineer, of Arizona, has opened the eyes of students of psychology to new possibilities of the animal mind. Only two years of age, this dog has been trained net only to add, subtract, multiply and divide, but also to read the mind of his master, this being done, as explained by Professor C. L. Salmands, head of nature study work in Los Angeles schools, by the joint powerful our-centration of both dog and man.

Numerous demonstrations have satisfied sleptical dues that there is no trick connected with the evidence of the dog's mental development, and investigators have come away with the convenion that, properly trained, the dog is a wentlerful think-

ing and reasoning animal.

It was thereigh reading an article by Macterlinek, on the scientific mental training of horses in Germany, that Mr. Tryon conceived the idea of experimenting with the profile he purchased in Los Augeles. He began by teaching the animal ordinary balancing tracks, and then finding effector not only obtaining and obedient; but a remarkably apt schular, legan to devote his time to the dog's mestal training. It regulated patient drilling has the results astounded him, for in a short time Hector was not only able to grasp the meaning of

more than one hundred words and to obey their command with the proper assion, but he showed evidence of being able to carry more than one idea or thought is his mind at the same time. "Heeter, roll over?" Mr. Try-

tor, roll over?" Mr. Tryon would constand, and Hector would proceed to do so. Then his master would order him to "roll over, sit up, shake your paws and bark," and after a little drilling the dog would perform all sets is their proper sequence. Once learned, an act, mental or physical, was never forgotica.

The dog's neathernedical ability came merely as a matter of bearing to distinguish and to apply on commessed the words "one," "two," "there," and so for 4 k, just as he had learned to distinguish between "situp" and "roll over," of the ween "pull it over," and "push it over," At the examment "Compatione!" Hector would be shown to tap a hell with

his paw, once. At first the word "one" meant nothing, but after being stopped on the first ring of the bell he soon took note

and stied to earth the word. At "Community he would have to strike the bell twice, and these commands would be repeated until he mastered them.

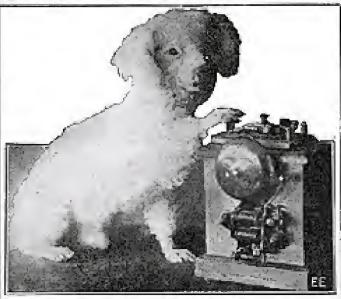
Then came the combinations, "two ples two," It required patient, laborious effor; on the part of his teacher, but gradually the little poodle learned to tap the answer for any plus combinatior, that did not exceed twenty-live in total. Whenever he exceed on any particular combination he was corrected immediately, and made to tap the right answer several times in specession, after separate commands, before any further progress was attempted. Heater simply learned that the command "Count two pins seven!" meant nine taps of the bell, just as he had learned that "sit up" and "roll over" meant a certain act on his part.

Mr. Tryon explained some of his methods and the success he has met with as

"To start with," he said, "Herror has perhaps no more wonderful brain than a great many other dogs, but he has had the advantage of scientific training. From observations and experiments I had king become convinced that dogs could think and reason, and I was determined to prove it. Finding Hector, like most poodles, very attentive and ready to contentiale his whole thought on every word spoken, I put forth every energy in his mental development. It became a hobby of mine, and I theoretically enjoyed what would perhaps tax the patients of the average man.

"Physiological experiments grove that the principal parts of a dog's brain are relatively located and have the same function as the houses brain. Like business, different dogs have certain well defined talents which can be developed to a remarkable extent by continued training, practicing, of course, that the dog has real brain capacity. Some humans counce learn anything, and some dogs are the some way naturally without brain capacity."

Recently Mr. Tryon has discovered that his French people has a remarkable faculty for reading his thoughts. Not being a student of mental telepority, Mr. Tryon is at a loss to explain it, but on many occasions he has concentrated his always on a certain member and, fixing his gase on Hector, has silently communited him to

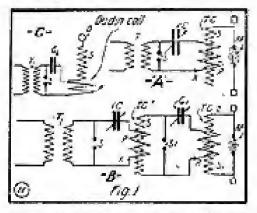


"Hector," the Dog That Tops on Bledtric Bell intelligently, it to Said.

"count" that number. And Hecter has invariably approached his tapping bell and counted the number correctly.

#### High Frequency Currents and Apparata

 VER since 1891, on which memorable
 date Nikola Teals, the wizard of high frequency electrical phononoma. delivered his famous lecture before the American lessions of Electrical Engineers covering his discoveries and experiments in

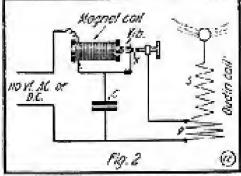


Diagrams For Oudin and Tesia Coll.

this wonderful held of science, the greatest sciencists of the whole would have been hasily occupied in developing and perfect-ing apparates of this nature for various purposes, including invaluable electro-therapentical applications wireless telegraphy. ese. Possibly the electro-medical profession has benefited more by the discoveries in this little known field of electrical science than any other branch of workers.

In this article will be outlined a few at the more interesting arrangements and types of apparatus which can be employed for the production of altra-high irequency. high potential electric currents, and which, as is generally known, can be taken through the body without feeling any appreciable pain. It is these high frequency corrents. which recillate at prowhere from properting to 1,000,000 or more times a second, which are attlisted in the many electrical stage nets touring the commery and which profepoly most repdets have seen at some same or other. The apparatus described in this article produces high frequency energies of this character, and many pleasing starting supplies can be made therewith similar to those shown or the stage controls and college professors.

At Fig. I there are outlined at A. B and C the principal brok-ups and layouts of apparatus accessary for the production of shese alter-high frequency arraginss. life. IA is depicted the regular Trada coil circults with a step-up transformer. T. spark gap S, glass or other high tension



Colling-Sanches High Programmy Gen-crating Coronit.

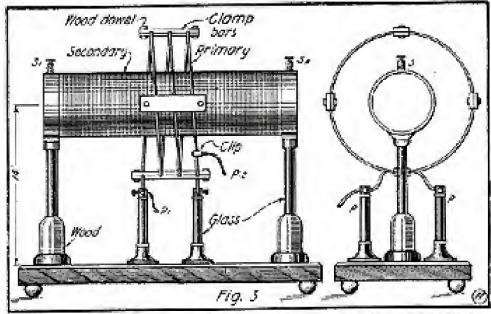
condensers C. preferably of the adjustable type, and TC the our-core Testa transformer. At P the primary of this Testa coel is imbicated, while at S is shown the secondary winding. The high frequency current discharges take place between the electrodes at HF. To properly time the classed assistating circuit SCP the condenses C should be made adjustable as aforemensioned, and also the primary inductance P should be variable by means of a clip X. This permits the capacity and the inductance of this circuit to be altered until maximum results are obtained in the Fesh coil secondary.

la some gases resort is bad to a comground Testa circuit as depicted in Fig. 1B. Here the good step-up reaustormer excites the circuit SCPX. The secondary S of Tesla coil TC then charges or excites the second closed oscillatory circuit S'CP, the final high frequency discharge taking place from the secondary S' of the No. 2 Tes's cost.

Where a discharge of great intensity is desired the usual book-up for a high frequency outfit is indicated at Fig. 1C. Here the same symbols refer to similar patts as just explained, and for this Oudin coll arrangement one unit of the secondary S is joined to the primary coil P; the other end of the secondary coil is connected to a braza or copper ball B. This scheme is

former P. The vibrator X carries extra heavy silver contacts and the iron armsture of the vibrator speling it attracted by the magnet coil as perceived. Thus this vi-brator performs two functions, viz., it serves to intercupt its own (magnetic coil) circuit as supplied with correct from 110volt direct querent or alternating contract, and also it serves as a spark gap for the high frequency oscillating circuit CSP. These high frequency currents thus pro-duced are constormed by induction into the secondary circuit of the Ordin coil S. This type of apparatus gives a very powerful and steady ami-adar discharge, and the current thus generated is much in use nowadays das nitrasvisien ray invatatent, exchartion of X-ray tubes, etc.
A great many experimenters passess 5

high voltage wireless transferings rated at 15 law, or more and giving anywhere from 12,000 to 15,000 votes at the secondary terminals. For those possessing such a transformer, and also for those who may be interested in hubbling a fair-size high trequency outlit and who can easily parchase a suitable transformer of the size afortmentioned, the following data is suggested. The Tesla coil here described will produce



Pig. J. A Well Designed Tools Cell, Sultable for Use on 14-Kw. High Potential Transformer,

different from those shown at A and R. Fig. 1 in that the secondary is placed at the end of the primary and not inside of same, as is the case in the regular Tesla

 coil arrangement.
 While on the subject of high frequency. schemes and circuits for same, it will mudoubtedly be of interest to cover one of the latest plans for this kind of work, or the Collins Sanctice high frequency generating circuit, as outlined in Fig. 2. This constitutes the idea now unifixed in a large quajority of the extra compact style high frequency sets supplied for physicians' requirements, etc. To begin with a small-size and very well-insulated Coolin coil consisting of primary and secondary P and S is made use of. The snowdary, as maderstood from diagram at Fig. 1C, connects to a metal ball or other electrode as observed and its other free terminal is joined to the primary P. High frequency currents are coused to be contrated and to oscillate around the circuit CXP, which comprises a mica or of we fairly high rolls. age o adenser C. a cibratine stock gap X and the primary coil of the Ondin trans12 to 15-inch high frequency sparks from the secondary when excited by a trans-

former of the type just mentioned. Besides the transformer in question, there will also be required a suitable glass plate condenses or the equivalent made up of leyden jars, and also a spack gap, which shall preferably be of the recent type so as to be well could. A quenched spark gao proves very efficient for this class of work.

Fig. 2 shows the appearance of the Testa coil design here proposed. The last of same may be made at some well-dried wood, and this had best be boiled in parathad was so as to exclude all dampness. Upon this base are placed glass supporting eads for the secondary and primary coils, and this will be found to give the very best efficiency where such high frequency, high potential currents are to be produced.

The primary coil is composed of four to six turns of about No. 4 B. & S. copper, brass or aluminum wire (stranded best). and these generalities of heavy wire see wound to a diameter of about 12% inches, spacing the turns about \$15 inches apart. The primary names are held in shape by four wast impregnated wonden clamps, as perceived. Also a clip is provided for one lead of the primary so that the number of turns in circuit, and nonsequently the inductance, may be varied in tuning up the

The enemidary coil may be composed of a cardboard cylinder 24 inches long by 5 inches in diameter. This is provided with two binding pasts at the end of same, as stance, and the winding comprises one even layer of No. 25 enameled or tilk-covered ougher wire, each turn being spaced from its adighbor the thickness of the wire itself to improve the involution. This can

he done easily in a serew-enting lethe. This coil should be hooled up as per diagram. Fig. 1.3. Regarding the glass place condenses suitable for a in 19-km, size high frequency coil, and considering that the easting transformer is easted at 12,000 volus (recordary), with a frequency of 60 cycles, then 46 micepiarads condenser appeality is acquired. If periods common glass as used in making this con-denser about 5,360 equate inches of such glass is required. This is costed on both sider with rin-ied; 1½ inches margin should be allowed around every tin-foil leaf on the glass plates. If the fail can be

to the condenser frame as in diogram, i, ea to apposite end of the metal strips, so that the high frequency inductance will be halanced, no matter how many condensary plates are in use. The number of plates in use can be varied by simply sliding them out of the rack, or also by removing one or more of the spring contact shore.

Regarding the details of rotary space page

suitable for this outfit, they are illustrated as Fig. a. Any small motor operating on eattery or 110-rols current is to be utilized in driving the rotary spark disc it. This disc is made up in the regular fashion as employed for wireless sees, but the place here advocated is a very good one, especialfrom the pir-confing perfet of view,

This design calls for a listingly sine or other motel alive about it inches in diameter. and 12 spark plugs are get into the disc as detail skerth B portrays. These sparking electrodes are cut on three sides and then the log is bens up. All of these logs when finished should be filed off or turned off in a lanke, so as to be perfectly true. This operation, however, had best be post-poped until the disc is firmly screwed or rivesed to a central hard rubber insulating high as drawing shows. The spark disc is held securely to the motor shaft either by means of a regular hub or by means of

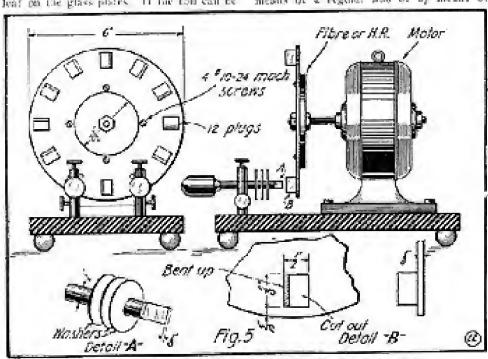
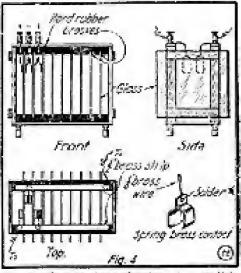


Fig. 5. Octobe of Rotory Spark Gap for Holler High Francescy Coll-

number 2-x20 inches on each place, then [1] such pipes will be necessary for this outfit. At Fig. 4 are shown a number of details. which can be followed more or less exacily in notking up a suitable condenser rack to hold those glass plates. This rock may be made up of wax impregnated wooden pieces, and usade of rame above are placed two hard rubber steips in cither able of the februe, which strips are slosted as perceived, so that the glass poster may rest edgewise in these slots, thereby reducing current leakage to a minimum. looking at the son view of the condensed come it is open that two metal strips run along the tap latel cubic strips and a series or binding posts are mosaised on those metal pieces. From each binding post there cans down between the glass plates a brase wire carrying a spring contact shee. detail of which is shown in sketch at Fig. It is thus perceived boys each alternate foll-less on the glass platte receives a posi-tive and suggestive charge. The terminal lead wires TI and T2 should be backed up-

because it is a ferential order the should. In front of the revolving spack wheel are resonated two stationary electrodes, and detail sketch A shows how the ends of these are filed down so as to correspond with the thickness of the rotating disc elec-modes. It is well to force a few cooling values (washers) tightly on the ciels of the stationary electrodes as indicated. A mar-ble have is best employed for mounting the motor and stationary electrodes with their apright standards. There are thus two spark gaps in stries in this design. It is well to have a shorestar in series with the spark gap motor, so that the speed of same frequency, in tuning up the complete high

When all of these parts have been properly made up or assembled and the diagroup followed as per Fig. I, there should be very light trouble experienced in producing a heavy high frequency spark I foot long or more, depending upon the adjust-ments of the circuit. The spork gap contensor and printing to I clip X should be admixted one after the other or alternately until the maximum resonance is obtained in the circuit as manifested by the produc-



Constructional Batulu of Glass Plate Cutdenwet. 12,000x V 913

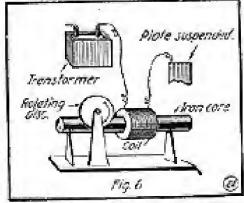
then of the largest spark in the secondary

girenit.
There is appended to this article a short bibliography of the more important articles. which have appeared in The Bloowical Experiography on high frequency corrects, and also a number of the best books available on the subject.

For those vitally interested in this subjust it will be well to purchase one or more of the books aremsoned. A few experiments of general interest are gited below.

An experiment not very well known, al-stough daring from the time of Tesla's first lecture on high frequency currents, is has which demonstrates how a motor may ic operated on one wire, and in some cases without any wires connected to it. Upon this and other experiments employing very powerful currents. Tesla has raken out a morber of patents on the torreless trans-

At Fig. 6 is depicted Testa's echeme for a sne-wire motor. One terminal of a sufficient high frequency Testa coil is booked up to a coil of wire wound on an iron once and in front of which is placed a iron once and at troop or once, which can deligately mounted metal elic, which can rotate upon its axis as perceived. The other end of the magnet coil is connected to a metal plate suspended at the air and which picks up energy out of the other, presumably. When the Testa coil is excited in the usual way the high frequency



Lesta's "Que-Wire" Motor That Works

entrem passes through the magnet colli-magnetising the iron core, and the retaining disc starts to move. Thus we have a single (Continued on page 164.)

structed from these metal girders, and in this way a very good wireless aerial can-be made up in replica, as perceived. Such an aerial as this would also be of good use

for wireless demonstration sets utilizing

the well-known coherer receptor, and purcicularly when these sets are used in lee-

cure rooms and theaters where a small aerial 4 to 5 feet high or even less will suffice. The serial may be made of copper wires No. 18 or No. 20 gauge, and a couple

of insulators may be placed in the support-

ing towers as sketch shows. It is also pos-

#### Stepping Stones for Junior Engineers four miniature steel masts may be con-

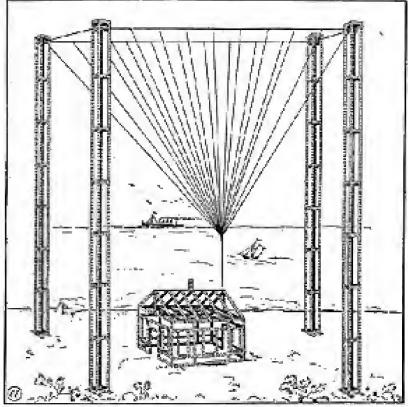
UR young boys and young men who are mechanically and electrically inclined have to-day wonderful facilities opened up to them in order to

regards the initial cost of same, it is hard to contrive of anything more eminerally practical and instructive. It is true that, while most boys can gain considerable educa-

tion by reading the immercias books available on subjects in which they may be interested, in is also equally tene that to gain a thorough and practical knowledge the netual work must be done in some form or other by the student bionself. These "step-

ping stones for iunior engimers, as they may be called, are equally well adapted for training the mind of youthful embryo electrical, me-chanical and civil cogineers Ar any rate, if the young studest does not Entend to fel-low up any of these profes-sions, he will gain a practical knowledge of

sible to very easily hulld a minimum radio station building to be placed at the fost of the masts, as seen in sketch. For the junior engineer there is probably nothing more interesting than the wonderful steam and electr ashovels such as were used in excavating the Panama Canal, and as used throughout the country for railread work in clearing away falls and embank-ments. Fig. 2 shows how one of these may be made up very nicely from these miniature steel beams. The shovel may be made to operate by an electric motor, and also a dry cell can be placed on the track framework. If it is desired, a speed-controlling throstat may also be mounted on the track. To make this more complete it is well to plane the whole machine on a length of track as shown in elected. With a little skill and care this device will prove of ununding interest to the boy mechanic-ally inclined, and it will scoop up a heap of dirt in short order. The forward beam carrying the secon proper is mounted so as to rotate, and thus each seconful of dire can be lifted and swung away from the truck before emptying, or it can be dumped into an empty feelight our placed alongside of the shovel, thus following out railroad construction in some detail. Preferably an electric train should be used for hashing



Medal Transatiantic Radio Station Constructed From Toy

train their minds on elementary engineering matters. There are, for instance, books on most every conceivable subject in the

handles of science, electric toys and other apparatus which con be purchased cheaply, etc.; but there probably never has been a more distinetly practical and self-educating device brought out for the aferomon-D10173908-0 tioned then that involving the use of miniature steel stompings made in the form of girders, beams and other necessary necessary

The illustrations herewith will give some idea of what can be done by young boys, even 10 years of age, with these miniature steel beams and accessories. There are several targe companies supplying excellent out-fits of this type, with which it is possible to lay out and build sky-scrapers, wireless towers, railroad stram shovels. Feeria

wheels, etc., in com-plete replies. While the present steel pieces applying up these minimum construction outfits are quite light and also low in price as

how boilding framework, towers and other raispellaneous mechanical parts are to be [astengs] and laid out in order to insure

Fig. r. A Realistic Steam-Shovel Composed of a Battery Mater, Some Ministers Giefers, a Battery and Speed Composer.

the preatest rigidity and strength, which knowledge all of as should have indeed. Our illustration at Fig. 1 shows how

the dist away, and in this way quite an elaborate engineering project can be carried can very nicely by one or more boys.

At Fig. 3 is depicted details of consesuction for an elevator in a building, and this is moved up and down in a very natural assumer by means of an electric

Pig. 3. Making a Sky-Scraper Wills Electric Higwester Out of Miniature Steel Beams.

motor, together with a rheastar, switch and battery, as observed. There is practically no limit to the number of different designs such as these which can be weeked out in an excellent enginer by making use of a small steam engine or electric motor and a quantity of these miniature steel beams and the variety of cold pairs, such as gents, polleys, etc., supplied with them.

# HOW SUN SPOTS MAY BE CAUSED.

BY PROFESSOR II. W. CHUPPS.

As we gradually descend into a mine, toward the center of the earth, the tempernature rises so rapidly that many selections believe that the center of the earth is a molten mass, enused by pressure or gravi-extion. When we realize that the sun, M-000,000 miles away, attracts the earth with sufficient force to hart millions of tons of water on our coast line, and that gravitasion decreases as the square of the distance increases we can partially realise the pre-mendous attraction at the center of gravity of the sun. The center of gravity, like the magnetic poles of the earth, is not startenany last is continually shifting. If electric fluid is composed of electrons, and it unlversal, the electrons at the center of greefly impat be under a heavy pressure, and if the conter of the casta becomes a molici

mass under pressure moving electrons under tremendous pressure at the center of gravity must become luminous and

of gaserty throw of heat,
This theory would account for the east as a luminous leafy, as a source of heat, as a powerful magnet, and also for the electrical disturbances seen near the cun during a period of sun speas; and if possible under these conditions for the sun proper to have a black-ened crust on its surface, lacks non through these laminous electrons by gases would areover for the sun spots and ther hery attreamers that are bucked thems ands of miles out into space. If we wish to carry this though further, it is possible that these same little luminous electrons will ar-count for the rings of Saturn. the Northern Lights and our Equatorial Light.

## NEW FORMULA IN CAL-CULATING CUR-

RENTS.
Probably the most accurate method of determining the value of the strength of an electrical enevent in absolute measure is by means of the Rayleigh current balance, in which the current to be meastried is passed in series through two parallel vicantar poils of unequal radii, one of which is suspended from the beam of a balance. The distamee between the planes of the coil is varied need the force of attraction between the two coils is a maximum, and the value of the ferre is ob-tained by adding neights to the other arm of the balance eatel its equilibrium is restored. Since the maximum force ob-tainable depends on the ratio of the radii of the coils alone. and not on their individual

dimensions, it is only necessary to determine further the ratio of the cadi of the coils, and this may be done with great accuracy by electrical

The constant of the interament-that is, the maximum force per unit current for the goils in question has been obtained in the sest by interpolation between values of the force, calculated for various assumed distances of the cods, in the neighborhood of the critical value for which the force is a maximum. For although the general formulas of Maxwell and Nagaoka give the value of the force for any two given. coils, at any assumed distance, with great accuracy, no formula has been heretofore published for calculating at what distance the force becomes a maximum. To snoot this tage there is derived in a paper just published by the Berran of Standards, cu-deled "The Cakelanon of the Maximum Force Detween Two Parallel, Coaxial, Cir-cular Coile," a formula which gives the critical distance as a function of the ratio of the radii. The latter part of the paper is devoted to the development of methods for facilitating the calculations. The formules are illustrated by numerical exam-ples and tables, and the new formulas are shown to give results in agreement with those derived by more indirect and laboricus method of interpolation,

# AUTOMATICALLY CONTROLLED ELECTRIC OVEN FOR TEST. ING SHRAPNEL.

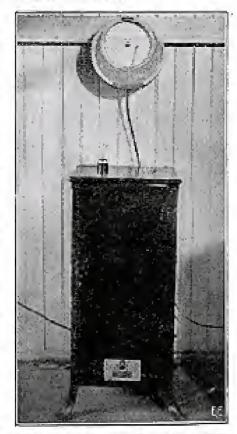
Among the many varying applications of electricity constantly being brought before the public, and one of the most interesting at this time, in view of the confect now raging among the leading nations of Eucope, is an automaticalled electric oven. it an automatic thermostatic can-

This occur is for use in one of the Gavernment assentis in Penesylvania for the testing of sarapnel alielis. In the testing of these shalls it is secessary that a temperature of 120 degrees Fahranheit for maintained continuously for 24 hours. This control of temperature is obtained by means of a compact type of thermostat which makes and breaks the heating circuit. which makes and breats the meating orders.

One counce; point is carried by the expansion member of the device and the other is adjustable by means of a thurnescrew which extends outside the case. A condenser across the contact points (sold) the arring those is fitted with a mercarial therm.

manneter for indicating the temperature. It is also fitted with a pilot lamp, connected in parallel with the beating element, to indicate when the current is on and off. On a continuous test for 24 hours the temperature of the oven did not vary more than one degree. This temperature reading is abown on the recording thermometer ust above the even in the accompanying

Hestration. The oven is of especially rugged con-struction and is designed to with said hard usage. The heating element is of the fa-miliar type as used in electric ranges, and is rated at 200 wests.



Sketric Oven With Automatic Heat Control for Shraphel Testing by U. S. Gevernment.

Electric ovens have been found to be suggestion to any other method on account of the perfect heat distribution. They can be used for a number of purposes, such as enameling, baking cores, drying, etc.

lighting outlet or wifes. The loc first case of

the equipment, com-bined with the case of

operation makes iss use advantageons and

pressionable, not only where preminate tools

have heretofore been used, but on a large class of work whose

magnitude äd not make it economical to ingtall an air oatfit.

A man with an elegatrig hammer may be expected to do along

as much work as six sacu working by hand.

This is easily explained by the fact that a your

with a hammer strice-

from 20 to 80 bloos a

gainute, while the elec-

trie meak strike from

be operated at a power cost that is prac-tically negligible, ranging front two conti-

to fire costs an hour and depending upon the size of harmer used. The equipment investment is small, only the first cost of

Fo use one of these hammers it is only necessary to connect the tool to the unwest

the sool having to be considered.

ILLUMINATED STEAM CURTAIN GIVES WONDERFUL EFFECT AT AT NIGHT.

The illustration herewith shown polyrays the remarkable effect produced at night by a beightly ithuminated sceam cursain, as errested number the supervision of a corps of Harvard University students, the work

having been in charge of Theodore C. Brown,

of Harvard. This instablation was employed in a wondertel outdoor show entisled. The Pageam of Lexaugaton. This steam cortain served the same pataloger is a segular theater curtain where the different scenes and tableaux were being assumbled. The entire entertain-ment was planned on rest: a targe scale that: the only sway the cortain effect could be preduced, it seemed, was by the employment of a second custom as the photograph here-with illustrates in a illustrates in a

vivid manage, The illumination for the Lexington pageant was planned by the engineers of the Edison Lamp Works of the General Electric Co., at Harrison, X. J., and it, in its entirery, involved the use of dozens of very powerfiel generalifights, besides a large munister of powerful tungsten lamp tanks and other sources of electric illumination unknown in their magnitude to the regular

theater stage.

ELECTRICITY AND THE 20TH CENTURY DENTIST.

Electrical apparatus is being utilized more and more every day to aid our sur-geous and particularly dental surgeons. In the photograph berewith as depicted an upthe patient arts and also an electrical res-piratory device is provided while the muse 19 the pecture is seen operating this particular machine. This is used as an aid in the pointers extraction of teeth. All drilling, chroning and grinding of the teeth is performed by an electrically driven drill justed with a flexible shaft enabling the



Mighty "Steam" Curtain Bluminated at Night. It Served for a Regular Theatre Curtain.

denties to hold the daill at any angle de-sited. Special forms of miniature "searchlights" help the operator to examine any remote part of the mouth and to work with case and surety.

EXPLOITATION OF FINLAND'S WATERFALLS.

The Petrograd Joint Stock Company for Transmission of Wider Power has made application to the Governor of Vyborg for permission to exploit the water power from the waterfulls of Roubialasky. It is proposed to build a dass reading from our bank to the other, with five passages of 16 feet in width for the nater consents, of a depth of is feet. According to the calcu-

brions of the Finland Hydrographic Eureac, the Buse of water is 12,000 cabic feet per second, and can be dipassages. The project

8.4:90 to 4.00.00. These electric haramers have long since cessed the experimental stage and are being used successfully by companies installing syritchboards, preminated tube systems, piping, rankings, sprinkler systems, for escapes, fire doors, etc. One large contractor tells of the great saving through the use of these tooks in taking out the moster betagen bricks for repointing, another of using them in breaking up old engine-hed insurations and sidewalks. Paiet mills use them for degraing call spones, ice plants and central stations for chipping scale off condenser tubes. In fact, wherever a rapid



libetricity Alex the 2018 Century Dentist.

horsepawer each. Water power is the enost efficient available.

peroxides for also creetion of nine aggregates. of tembines of 10,000.



EFFICIENT ELECTRIC HAMMER.

One of the special applications of electrighty comes in the use of electric haramers, reptacing the man with the sledge or hammer and star drill and the air com-pressor with its paping and hose.

The line of bannacrs that is made by one ed the leading electrical manufacturers can



Old Manual Spage Method.



Now Bleetric Remmer Method,

specession of blows makes for saving, these electric hammers are being used successfully. They operate on the reciprorating electromagnetie system and provide a nuncitdesired implement for this class of work-

to-date electrically equipped dental operating room in a well-known hospital located in Boston, Mass. All articles in this operating room are furnished in the most sanitary way even to the chairs which are funished in percelain and enamed.

Electrical foot control abrostats are conveniently placed about the chair is which

# THE CONSTRUCTOR

THE



## How to Build a Dictaphone Desk Set

By Homer Vanderbilt

a like dest; relephone outlined below is. a first-class instrument, very povel and new besides being of easy and simple consequetion. Furthermore, the use of this instrument is different from the malicary telephone, in that the receiver and transmisser are not brought into consert with the party using them. One may communicate with another party by morely placing the apparates at a surable distance on the desk and talk in the usual way without holding

the receiver to the ear,

The case may be constructed, as shown in Fig 1, from some hard wood, such as oak, walnut or andoquaty; the base of which is hollowed out, so that the ringing key and our acts one be placed inside. It should then be glaced or stressed tage for, using flat head brues screws for the purpose, which will make a very near job. The front wooden piece is made as depicted in fig. 2 and state the reason in Fig. 3, and into the two holes are placed the transmitter and sectives. The manufacter is of the "Diographone" true, as illustrated at Fig. t. The case is baile from an old watch case reevicer, with the usual pasts removed. The sap is placed in a lattic and the

hole made larger with a boring tool, madit is measures 170 inches in diameter. This increases the area of the diaphragm; This increases the area of the diaghragm; thereby also increasing the sensitivity of the transmitteer. The cashon cup. C. is made suffrencia circular carbot red 1% inches in diameter and 21 inch long. Five bales are frilled with a No. 15 drill on one face of the earbor, as Fig. 3 shows. These holes must be exactly drilled. The two faces of the carbon rod, C, must be exactly puralled with each other, as the operation of the transmitter is entirely based upon this point. In order to do this it is advisable

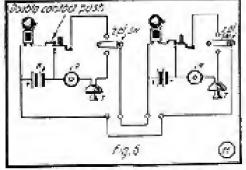
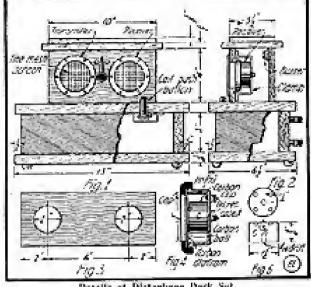


Fig. 4. Connections of Histophysic Sets

to have it turned in a little. The hosport hole for fastering it is now drolled with a No. 14 drill, and then some meltest scaling wax is poured into it. While stell nots at 8-82 hears screw is inserted and the wax is then allowed to pool. This Suished. it is placed in the receiver case and a carbon displicagin placed over it, with a sheet of sin-foll pressing on the disphragm in order to make contact. Test the classift to see that the cup dees not touch the diaphragm

and if O. K. fill the holes in the cup with small carbon balls (siot grains) about the size of the bend of a pin, provincially from electrical supply houses. The displirages is now replaced and securely fasteard and



Deseits et Distaphone Desk Set-

the tin-fail is connected to a binding post, as depicted in Fig. 4. The transmitter is now tested by connecting a telephone receiver in series with a battery.

After completion and test of the transmitter is cheed to close of one of

mitter it should be placed back of one of the holes in the front wood piece and se curely fastened by means of a brass strip, as true, 2 illustrates. The hole is then covered nearly with some coarse mesh

The receiver is of the wasch case pattern. and also of the low resistance type. A 74ohm receiver is obtained and the permanent and electro-magnet removed. The coil is and electro-magnet removed. The coil is rewound with 120 feet of No. 26 enamele. the previous winding. After this has been done in its placed behind the sententials being done in its placed behind the second below the previous winding. After this has been done it is placed behind the second below in the cabinet from and fastened in the same way as the transmitter. A screen is pot-

The ringing key, or "double contact" pash button, which is bruded in the lower box, can be made in any form and no further description is necessary. A buzzer for calling is placed on the inside back of the ease, as indicated in Fig. 2, and also a 2-point switch for the circuit is mounted on the front, as seen.

Fig. 6 outlines the competions for two sets of apparatus. Several of these outlits can be successfully used in circuit if desired. Three to four dry sells are usually sufficient for each station on 50 to 75 feet. circuita.

Now, with the above apparatus com-pleted, close the switch and paces the push

button. This mage the party at the other end of the line; and with both carries situated at apout 6 feet from the prephones. reneversation can be easily, distinctly and and bly conducted.

This tree is ether climicates the

bresome holding of the receiver and, above all, holding on the month near the misanitary and (somerimes) gener-

corrying transcribites.

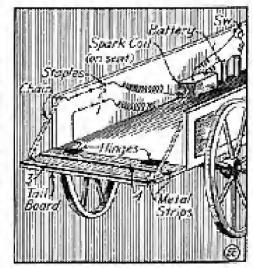
As the current used is quite heavy. a large wire most be used to connect the two stations together. For stations 20 feet apart No. 18 B. & S. wire will 60. For a disquire of 50 feet use No. 16 wire: for a distance of 160 feet use No. 14 wire: for a distance of 200 feet ese No. 12 wire.

A "KID CHASER" FOR WAGON TAIL-BOARDS. For track delivers and others when

are nizen amsoyoù by children stealing rides on tail-housels, the following scheme will be found efficacious in the presention of this dangerous univance

All that is required is a small spark coil giving 16-inch or greater spark, together with batteries and controlling switch, which may be mornised on the lack of (or under) the seat of the

wagon. Two high-tension wires are carred along the frame of the wagon, as I and 2 indicate in sketch. One wire is joined to the bings of the tail-board or simply direct to a metal strip 4. A second mental strip is placed across same at 3, and



Sport: Coll to Keep Children Off Wagen Bear, 2.

this is joined to the high-tension cable through the supporting chain, as sketch in-

dicates.

Now, when the youthful joy rider mounts the call-board the draver can throw in the sected and the pleasure trip is absurably remained. Contributed by T. W. E.

#### Construction of an Inductive Tuner

By Milton B. Sleeper

Part II-(Conclusion)

Coupling Adjustment.

The back and side views of this unique control are shown in Fig. 10. On the same shaft with the handle is fastened a square brass tube. Inside this is a square cod. To prevent its interfering with the secondary taps it is best out. The upper end, which is flat, has a round tabe going through it parallel to the shaft of the handle. When the instrument is assembled a rod held

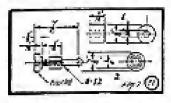


Fig. 7. Betalis of Binding Posts.

nightly by the screw eyes on the end of the secondary turns in the tube (see Fig. 3). As the handle is turned the square rod slides in or out of the tube, because the rod at the top must travel in a straight line, while the guides inside the primary keep the secondary from turning. Oil all the moving parts; there is no current earried in this adjustment.

Binding Posts.

Referring to Fig. 7, these binding posts.

are composed of four parts: a serew, a bard public landing, a not and a thereb-The bushings must fit tightly in the

Coli Center Pieces. Fig. 8 gives the size of these pieces. In turning them up, born the %-inch hole in

the center first; then turn them on a wooden face plate which has a hathe mandrel to fit rightly in the hole. If the hole is not exactly in the center of the pieces the secondary will not be concentric with the primary. Take (A) first. After shellacking and rubbing it down-fasten it in the left-hand end

of the primary tube with strong give. To it properly in the box the end of the tube must be at right angles wift:

11 5 3 3 14.

Refore fitting (B) each sec-ordary tap must be fitted with: soft rubber tubing to insulate and protect is from rubbing. When this is done pull all the taps out at the left-hand end of the coil and bind them to-gether with string hi inch from the coil. Leave two or three inches of the binding string on the taps. In (B), between the slit and the center, make a small hole, just large ecough to pull the loose ends of the binding string through it. Now bend

the taps where they are bound and poll-the ends and of the right end of the cube.

cle is just 1,34 inches in radius 9/32 men will go in the circle just 20 times. The

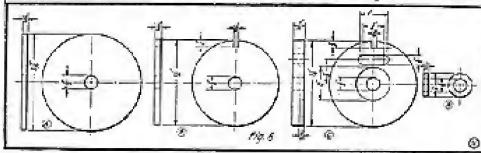
bales for wood serews are consterrunk just enough to make the serew heads flush.

Fig. 10. Arrangement of Secondary Courling Level and Knob.

In laying our time scale for the coupling handle, scare the hard rubber with the dividers. Then with a very fore brush fill in the serutches with white gaint. This makes the scale stand but clearly.

Connecting the Taps.

When the switches are all fastened to the front at is time to connect the taps. By all means use logs for this. The right size can be obtained from Clapp-Pasthum. As each one count be soldered to the wire, which can be made to get some very soft solder which can be melled by the heat of a market. There are several kinds on the market. Start at the test of the coil with the compensator taps, otherwise you will get into trouble. Cut all the taps a little longer than is necessary to reach from the coil to the switch. Do not take any chances on finding, when you put the colls in the case, that the taps are too shore. Slip a piece of subber tabing % of an inch shorter than the tap over the wires. Then solder on the lugs. It is best to try this on a separate piece of wire, for some diffi-culties may be encountered. When the compensator connections are made (see (2) Fig. 4) do the same to the other taps.



End Pisco of Secondary Coll.

holes in the case; a lattle shellag will make them stick. The connections on the Inside should be neatly soldered to the under side of the screw head. Then the part is screwed tightly on the bushing. Outside When (B) is glass in place fasten the blasting cord through the little hole, so that the taps will be held family to the wooden end. This is to prevent their breaking off from bending back and furth at the second-

ary is moved. The tapa should come at the top of the coil. At the bottom of (B) fasten a little brand piece X that will slide between the guides inside the primary. Put in the piece (C). Divide the taps into there or four bundles to go through the hole in the end piece. That is all there is so do with the coils at persent.

Cabinet Pront. Fig. 9 gives the dimen-stons for the front. Creat care must be used in laying out the beles for swhell points. Always make a dent with a center punch first, otherwise the drill point will run over the subles. They should be fald out with a pair of sharp-pointed dividers. First make a cir-

Statist State (3)

> cle 1.34 inches in diameter. Then, by experimenting, the exact distance can be found to separate the holes. If the cir-

17.9

Fig. 2. Saidth Lay-Out for Inductive Coupler.

councerious are clamped by the knurled thumbserews. This makes a near and leakproof binding post.

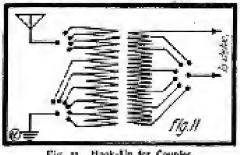


Fig. 33. Hook-Up for Coupler.

Starting with the tap from the seventh tuen, festen it to the top switch point on the large circle. On around in order until the last one is connected to the thirteenth point. Test the coil with a buzzer and battery to see that the winding is all right. Do not touch the secondary taps until the coils are fastened in the case.

Fastening the Colls.

Now, when the case is put together, except the top (look at Figs. 2 and 3) to see where to fasten the slide tube. First put the primary, secondary and small end piece (D, Fig. 8) on the tube, with the coils in the center. Do not fasten the from on yet. Spread cold glue thinly on the primary and piece and the piece (D). Press them against the ends of the case, estimating the distances shown on the drawings. Quickly, before the glue can set, put two or three strews in the front-just two or three strews in the front-just enough to hold it in position. Take the rod which is to go through the strew eyes X on the end of the secondary and put it through the tube of the coupling adjust-

ment (see Fig. 3). If the tube and screw eyes do not line up perfectly turn the primary or piece (D) until they are in alignment, otherwise the guide will bind against the wonden strips in the primary. Read these directions coverfully before attempting to put the chils in; if you do not know just what to do beforehand you will make had work of it. The secondary taps may now be joined. Move the recondary all the way inside the primary. Then run the taps under the long staple provided for their support, and up to the switch points. These, too, must be soldered. Do not forget, however, that the left-house end goes to one of the binding posts on the right side of the case. If the taps become mixed test them with a battery and buzzer. By

comparing the sounds of the busser the order of the taps can be determined. The copper strip from the spring of the secondary switch gives to the other binding post. The strip from the spring of the primary switch and a strip soldered to the contact of the compensator go to the binding posts at the left of the case. The compensator connection must be supported so that it will not interfere with the movement of the contact.

Fig. 11 shows the confections in the receiving circuit.

(Note.—The publishers shall be pleased to furnish the names of the manufacturers supplying Nes. 13, 14, 47, 69 on receipt of two-cost stamp to cover postage.—En.)

		.I	IST OF PA	RTS.	
0	Name.	Pletes.	Masestal.	Size.  744" x 444" x 47".  744" x 444" x 6".  642" x 444" x 54".  141" x 144" x 54".  64" x 444" x 54".  64" x 444" x 54".	Remarks
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	Ten of the state o	1	Makorana.	76" × 56" × 6"	Sheller and polinh,
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	Washer for centre piece spring	1	Bears.		T. 41.1
	Sentre tota for realts also:	Ī	Brass.	267 x 87 x 0 0 1 1 15 00 1 1 1. Bend, the sq. x 55 5 d. 27 x 55 0 1 15 15 1 1 1 1 1 1 1 1 1 1 1 1 1	Potlah.
	Square pad for centre presentation	- 1	Prasse	Bend, An Management	Polish-
	require pag and occurrence and a second and		Brane.	200 - A 100 C A	Polish-
	Round tube too coupling refrestrette			TA N TA WE CE IN THE MINISTER OF	Polish.
	Round not for empling adjustment.	3	Deast.	The State of the S	A MITTELL
	Not for empling adjustment	3	France-	36. X 8-34 Hiter-satzetarinista	75 61 761
	Printers were accommended		Cappen	Sec. Ve ill Pharman and a constant	Darble silk.
	Secondary wine		Capper.	No. 20 B. S	Double silk
	Secondary wire		Self in Red.	Set h direction consequences	
	Carlo Car canadariana		Copper.	24" v 36" v .005"	
	Strip for connections.	1.7	Heate.	Equi. Va diameter	
	Support for serbadery 12/8				

" Megns, see end of article,

HINTS TO THE AMATEUR.

It is indeed surprising what a wealth of electrical material for the experimenter may be found around telephone exchanges, lead electric shops and garares. Material such as percelain queris, magnets, wire, slightly used dry batteries and many others, which will delight the experimenter with a somewhat flattened pockethook, may often be obtained for the asking.

In one instance a wireless amateur received a complete head set and enough wire for an acrial in this way, while I have used with suppess for six menths, on my 1-inch spack-call set, dry hatteries which were discarded from an automobile. A No. 8 B. & S. covered line wire, which had been shrown away at a power house, was utilized for making a dataly helix. The insulation was removed by hammering on it, causing it to separate from the wire, or it could be become off.

burned off.

The center binding posts of "Columbia" dry cells may be used for taps on a loose coupler, after being cleaned by placing in a cliqued solution of sulphuric acid and then filing the heads quite flat.

The cup on the center of the "Everready" type of dry cells may be used on a detector for holding the crystals, while the wax on the top of dry hatteries may be comelled and east in paper molds to make

a variety of kooks.

Enough magnet wire for a loose coupler

may be seened by asking for a hurned-out "telephone bell" with magnets, at a local telephone office. A friend of mine secured, gratis, an old automobile ignition spark coil at a gazage, and has used it for sending message one-half mile nicely. Contributed by WM. R. COTTRELL.

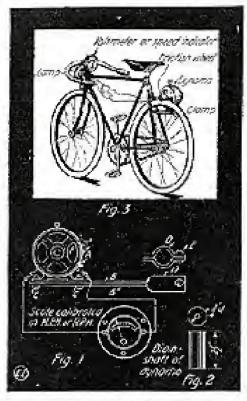
GERMANTOWN RADIO ASSOCIA-

The Germantown Radio Association, of Philadelphia, Po., would like to receive a few "sporks" from those interested in radio work. The club is now located at 5801 Germantown avenue. Germantows. Philadelphia, Pa., and meets on the third Monday of each month.

#### HOW TO BUILD AN ELECTRIC SPEEDOMETER.

A most interesting application of elemtricity is represented in an electric speedometer, an instrument used for tlengting she speed of vehicles its any other moving

object.
This type of speedometer consists assemtially of two parts, viz., a discon-current generator of low amperage, which is driven



Electric Speedometer for Bkycles.

by friction or genting from the wheel of a vehicle, for instance, and a volumeter conterned directly to the generator.

The dynama, Fig. 1, may be an 8 or 10 with machine. Now make the supporting parts, which conduct of two iron clamps. B. B. attachable to the dynamo frame by means of boks C.C. The curved part D is used to fasten the dynamic to the vehicle, such as a bicycle frame, tightened by an-other store bull E. Any other suitable means can be employed in fastering the dypanea.

A small rubber friction wheel is next made, and it is shown in Fig. 2, no explanation being necessary, as all the required data is given. It is driven tightly on the drisamo shaft and is to be placed in con-

test with the driver wheel. The recording device consists of an ordimany voltingter, but aunthor scale is substisoled for the original one and calibrated in speed units, such as "unites per hour" ar R.P.M., etc. The method of calibrating the voltmeter is as follows: Obtain a standand speedometer and place on the driver selects, and at the same time secure the dynamo near the same driver and connect it to the volumeter. Now start the velocity wheel pushing (on a frame) and observe the scale on the standard speedometer, and note the position of the volumeter needle. At that point mark a line, and the same nauce as the standard speedometer is thow-Various points should be thus checked off in the same manner by running the vehiele wheel slower of faster.

This desire can be used as a tachameter or revolution per minute indicator, the one point that must be remembered being to use a standard R.P.M. indicator as a speam of galibra dug.

The volumeter should be placed in a convenient place, so that the operator may cast his eyes on it very quickly. On a hieyele a good place is on the handle bars, as shown in Fig S.

This speedometer can also be used on automobiles, carringes, motorcycles and any other form of vehicle. It is useful indeed for testing machinery of all kinds. calibration can be performed by calculation, aided by a common hand speed indicator. A small regulator magneto serves very wellfor this sount, but then the voltmeter must he ân A. C. instrument. Contributed by SIDNEY SISSELMAN.

#### AN ELECTRIC KEY HOLE FINDER.

For those gentlemen who are inclined to stay out too late in the evening, or rather maning, and who often experience considerable trouble in locating the keybale in the front door of their domicile, the following

wrinkle may be of interest:

I norched out a small hole in the side of the door frame on my front door and placed in it a miniature battery lamp receptacle and a small Tungsten flashlaght bulb. A bustery may be placed in the cellar similar to a bell battery, etc., and ordinary bell wires, preferably fished up inside of the door frame, or otherwise apply concealed, lead from the lamp socket to a circuit closer placed under the front deer not as the sketch shows. This circuit closer may be purchased at any electrical supply store and can be located under a certain corner of the mat, etc., so that the home-comer will possibly sponer or later place his foot on the proper part of the mat, and thus flash on the lamp which illuminates the key-

It is hoped that this nevel idea will be found we come to many brother "Elke." Some nifty stunt. Etcl what?

Committed by ALBERT GALLAGHER. It is generally admitted that the herdest problem to to feel the heglinic in the "wee email hours" of the morning. The writer of this acticle presumes, evidently, that the rapidly oscillating movement of the feet



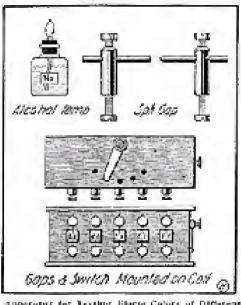
An Electric Light Finds the Key-Hole For You.

very shortly will locate the proper contact spot on the wat - fid.

CHARACTERISTIC FLAME
COLORS OF METALS.
Where a gas containing restalling inter-

heated to incandescence if exhibits a color aned a spectrum, which are characteristic of the metal which it contains. Each of the 60 or 70 kineson metals has its own flance color and spectrum. With the alkali and alkaline-earth metals, in is only necessary to heat a salt of the metal in order to obupin the colored flame. With all the others, however, the metal itself area be volatil-ised, which can readily be performed by the electric and or spark.

The exhibition of these various dame colors is an interesting and rather spec-tacring experiment. For the notals of the first division be apparatus is very simple, An alsohol long, which can be easily made. out of a small issue, a cork, a metal tobe and a wick, is provided for each metal and labeled. In the abulod of this lamp a salt



Apperatus for Testing Plante Colors of Different Metals.

of the desired metal is dissolved. chloride is the most convenient, both because it is the commonest salt and also because it is adultie in alcohol. The sale ninst by chemically ours, for it it is not it is sure to contain teachs of sodium, whose brilfilms yellow flame quite obscures that of any other metal.

The presence of traces of redium in atbecome all your runsions because he proved by holding almost may object (an iron unif-for firstance) in the coloniess Bionson flame, which will be turned vellow for a numerat. If the salt dissolved in the alcohal is chemically pure, however, the flame of the absolute lamp, instead of being colorless, will be yellow, violet, green, orange or deep crimson, according to the metal used. In a darkened goom this is very striking. The colored flame, when examined with a spectroscope, shows the characteristic lines of the metal.

For showing the metals of the second class a strike of a nall spare gaps are used; the electrodes of the different gaps being made of the metals to be examined. The caps are put into operation, one at a time, by means of a sainable H. T. multi-point switch. The electrodes should be very chose together, adoptst totaliding, so that the "spark-ball" may be formed. A very bril-hant some is produced to this very. It may be examined with a spectroscope, the same as the alcoima flame.

Belove is a list of the more common cassals and their flame colors:

			F.	31	10	Т		U.S	g	100	F.				
Sociem. No.					ķ.		L		-				. 1	3	iclion
Pensium, K.	10	1 3			٠.			1 4					-	-3	ne'st
Calcium, Ch.	<b>E</b> 1	r i	7	1.3		10			-		•			-5	January.
Bariton, Por	- 1	r i	=	1 0			п.,	17.	-		-		٠.	-5	PLE DINE
Sprontinen. S.	Γ.,	13	1		• •			11	11	1.5		0.0	1	13	PERMIT

SECOND CHOUT. Contributed by B. MACKEY.



## The Amateur Radio Station Which Aided Uncle Sam

A Complete Description of the Wireless Station of Mr. Charles E. Apgar—Full Details of the Audion Amplifier Circuit and the Inductance Coils Are Here Given

By Charles E. Apgar

S INCE the publication of the article on recording Sayville radio signals phanographically in the September, 1915, issue of the Electrical Experimenter, so many inquiries have been received by

Pag. 1. Top View Depicts Me. Chia. E. Appar Receiving Wife-less Decoages at the Window-felly Edificient Experimental Pagin Station Located at West-liels, N. J.



Lower Photo Shows Mr. Appeal in the Act of Actually Recording a Long Distance Radio Message on a Phomograph Cylinder. This "Cannoll Wireless" Has Helped Uncle Sam Immessage phly.

use from inseressed anothers, and others concerning many details of construction, eigenfus, etc., that I thought that possibly a more complete statement concerning the station and the work accomplished would he welcomed by many readers. Also since the station has been so governously referred to in the daily and technical press since July 18, 4915, a brief history of the station.

itself will surely be of interest.

Not many years ago, less than five, when looking over a magazine in a standary store on Broadway, New York, I need in the last's section some zig-zag lines and drawings (diagrams of radio circuits). The magazine was immediately inid aside with the thought: "What manages to print such cracy stuff which only an expert can understand."

Alpest a month later the New York Herald published a letter signed "Austicus" stating that on the previous exeming (Elec-tion night, November, 1910), he had expect the Florald's wireless Election returns and knew the results of same before 11 p. n. of that evening. Comments by the editor followed, stating that "Annateur" was a cashier in one of Wall Street's well-known banking booses; the name and address were also give. This was my first transfer of the cash stopping pince when again reaching the

This cashier soon discovered that I didn't know a neming cost from a detector, so he

gave me a copy of the latest callingue of one of the leading experimental wireless supply houses. Careful study of this and treating the zig-rag lines and deawings in the magazine (Modern Electrics), to which recourse was cande.

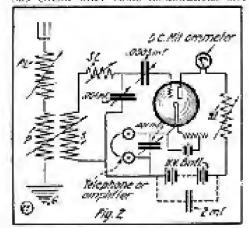
gave me sufficient insight as to the requires ments of amateur viscless relegraphy to make a "try-per" about one much later (Dec. II, 1916). I shall never forget with what satistakener I made new final. econocition was that memorable evening. In less tigm one minute. I heard O. H. X. (now W. H. E.) Scagate and ose other station. Contracting this with the experience of some amateurs (who, as I have read, often speed a impaich or mare laufing around before getting a single signal), to say I was carlened is putrion it mildly. Of course, the whole fantthe was called in-creat the cat whose "meon"

was about as near to a wirekes signal as anything I had ever beard.

Having eaught the feete and wring some constructional ability, by instruments were home made, excepting the de-tector stand and allique (purchased from the E. I. Co.) and 'phones. After installing this set on a suitable operating table and getting reasonably familiar with thesing operations, even to picking up Cape Cod (old M. C. C., distant about 350 miles), I decided to look into the matter of sending signals. I found a single unit automobile spank will among some clee trival reak, connected this to my averal skrough some wire wound around a lox and having no sceeding key, tagged on one of the hinding posts with one of the hat-tery wises to see it is would buzz. It did, Then wishout knowing why, I tapped off the call "H. Q." whom I had heard sending to other amareurs. "B. Q." lived many blocks away, but after a reasonable time the coor bell rang and, meen to my sur-prise, there was B. O. in person. Said be had beard me call him, and shough it was near midnight came around to see what a lieve that an efficient sending set would not be difficult to make. I some began out-simming a % K. W. open-core trans-former, also a suitable condenser, using attantum shorts and old photographic platest an assistary spark gap in first, but

later a rotary, capable of breaking 960 perserout. Getting eather tired of hearing "How's my spark?" "Po I sound better now?" I decided to turn my attention to improving my receiving apparents. In all seven different tening gods and loose completes, each possessing some apecial feature, have been made (see Modern Elec-trics, January, 1914). Variable revery abundancers were most constructed and, being dissatisfied with the unstableness of grystal detectors, I defided to try and an audiou during August, 1918. Howing some knowledge of the effects of magnetism on electricity in a vacuum, I placed a magnet near the audion, when instantly the signals seemed about ora takes louder. Here was a discovery-to see at least. A new lot-fact steel must loomed up, as well as other extravagant expenditures—all to come from the proceeds of this discovery -but a short time spent in the city library brought me to earth again. I still have my agrick in the times.

The use of the magnet was continued for some months with gratifying results. Many sections, with the use of a case!! born on the receiver, could be read about 50 feet from the 'phones. Floring been able to definitely and satisfactorily to produce loud incoming signals, the matter of amplification occurred to me. I tried out various types of microphone transmitters. Best results, though far from satisfactors. were obtained by a certain form of carbon tranymätter, using a law voltage curiteist. Signals from many stations, when usbag this girecit after some modifications and



Audien Ampiliter Clicules Employed in Mr. Appar's Radio Station.

giving careful consideration to sound resonance, could be plainly locard and read all over the house.

Naturally the matter of making permanicut records acquered to use about this time. I hought a second-hand phonograph, and on Oct. 28, 1918, made my first record of teleplars; this being "press," seen out by the New York Steral) station at the Bartery in New York, Following this and until about October, 1014, many records were made of N. A. A., N. A. H., W. C. G. and other stations. By the adoption of the audion circuit discovered by Mr. E. H. Arntstrong, the receiving effective of my outit was enormously increased, as well as being cachied to bring in many undamped wave stations, including W. S. L., W. G. G., N. A. A., N. B. A. and others. Interesting phonograph records of several of these undamped stations have been

The photograph of my station is shown in Fig. 1, which consists virtually of a loose coupler, primary and seconiary loading coils and three variable condensers connected to an Armstrong circuit as perceived in Fig. 2. The dimensions of my inductance coils see as follows: Primary of coupler is 10ab inches and is wound with No. 22 S. S.; the secondary loading coil 51 is 22abh inches and wound with No. 30 S. S.; the tecondary loading coil 51 is 22abh inches and wound with No. 30 S. S. white the wing inductance WI has No. 30 S. S. for its winding. The capacity of each condenser is given in the diagram.

A direct current milk ampere meter is connected in series with the gold circuit as shown and signals can actually be read by observing the measurement of the needle. An amplifier of my own invention is connected in place of the degular 'demos and a low resistance receiver with born is coupled to the amplifier. The same 'phone can be placed over the recorder of a phonograph and thereby messages may be copied on a network. Fig. 3 illustrates the phonograph which has recorded all the Saywille "secret code" messages—note the telephone receiver on the reproducer.

My nerial is 600 feet long, the wides

My perial is 600 feet long, the wires starting 10 feet apart and ending 18 inches apart (feet shaped); the average height is about 50 feet. With this set 1 am table to tune to 4,000 meters without any aerial inductance coils, and 47 leading coils are connected in the circuit 1 am able to receive stations of over 9,000 meters wave length.

While the September, 1915, issue of this magazine has given rather a full account of the work done at the request of Chief W. J. Flynn, of the U. S. Government Sected Service Bureau, probable the addition of a few other details will make the account more complete.

A short time before being asked to do this work a husbress call was made on Chief Radio Inspector W. P. Krumen at New York City, and during a conversation on amateur plants in general he expressed a desire to visit my station. During this visit, which soon followed, the general effisirucy of the station was demonstrated, also many phonographic records of wire-less sisuals were reproduced. Hence when Chief Flyan consulted W. P. Krumen alant the checking up of Saytille I was called it on the master and told to 'get The work of making the records histor. hopen each night at 11 o'clock and contimued for two or three hours, dependent on the accumulation of messages at the Sayville station. The next morning a translation of the records was made and a copy of them turned over to Chief Flynn, which permitted of immediate comparison with the censored message records received by other departments of the Government. Later on all the phonograph records made were delivered to the Secret Service Butteau at New York City.

\*One of one editorial staff has recently untitional this experiment with the milliampare moter. Sixuals were receable by measly observing the

#### New Pocket Wireless Set

One of the latest developments in the wireless field is a small, pocket-size wireless instrument which can be used for transmitting or receiving such mestages over distances of one-quarter to one-half mile and more. This particular apparatus

metal tube held in the hand to the instrument proper. In some cases the tube has been placed in the ground and messages received and transmitted in this way. When the metal tube is held in the hand, as shown in the right-hand photograph, it



Photo (C) by Underwood & Underwood.

At Lette Showing New Pocket Wireless Set Pastemed to Bell.

as shown in our illustrations has been perfected by Dr. H. Harringer Cox, of New Bedford, N. Y. The inventor himself is seen in our illustrations, the one at the right depicting Dr. Cox in the act of receiving a wireless message by means of the apparatus strapped about his whist as perceived, and the artena consists of a hollow tabe held in the hand.

The left-liand view discloses how the apparatus may be worn under the coat, and it is held in place by a belt, as becomes evident. The 'phone and bead-band can be looked in the belt very readily, and it is suggested by Dr. Cox that this outfit would undealstedly prove of great value for the soldiers in the field. He intends to loan his invention to the European amoins now at wer. Such an outfit as this can be worked over such distances as aftereme value to the men in the trenches or on the open field for transmitting and receiving orders, etc., as the enemy would not very easily take notice of each a well-concealed wireless instrument as this, even though the operator was in sight. The apparatus comprises an especially sensitive detector. Especiator with the usual high resistance head phone and a tuning roll with condenser. A flexible with joins the watch-case telephone teceiver to the tuning coil case, and another flexible conductor joins the hollow

needle. One of the greatest feste over produced by any amount is beceiving N. A. A. Got deal from the 'shouts' which is an extent result appear appropriated by Mr. Appear. He has received the "lime signals" from Arlington in the open street, full of stands treet that while notices of all lands were in the versing. Of course, if these conductors due to provide the signals would not be signals when the property of course, if these conductors due to a provide the signals would individually be based as a much version distance.—Become

would underliefly be best to make a ground connection by means of a wire connected up with a metal plate on the bottom of the phot.

#### MARCONI ABSORBS ENGLISH POULSEN INTERESTS.

A syndicate representing Maccotti interests has acquired the Poulsea-Padna rights, and in due course the Poulsea system will become part of the Marcotti organization.

According to this report, an important option in connection with the British Poulsen wiseless rights lapsed recently, though fresh arrangements would quite possibly have been made. In the meanwhile, however, the syndicate representing the Marconi interests, recognizing no doubt what a formulable rival the Poulsen system would be in the future if it remained independent, has stepped in and made an offer which apparently has been accepted.

For the present, owing to Treasury restrictions, formation of a substituty company and other financial arrangements for the completion of the deal cannot be put through, but after the conclusion of peace it may be looked upon as certain that Foul-

sen will be under the Marconi hanner.

The Proben system of wireless telegraphy, worked out by Valdemar Poulsen, of Copenhagen, eight years ago, is said to be a much faster means of communication than that of Discount. In 1907 Professor Poulsen also talked by wireless between Copenhagen and Berlin, some 250 miles, and proposed to establish a wireless telephone service to America, via Ireland. The Poulsen pateois in the United States are controlled by the Foderal Telegraph Co, of San Francisco, Cal.

## A MACHINE THAT CAPTURES AND HOLDS WIRELESS TALK.

When one contemplates the marvel of sculptured sound on a graphophonic record, and realises that from the cold variety of line there may magically spring the golden lift of the greatest song voice that the world has ever heard, then comes the conviction that we are living in the days of white magic.

This is simply by way of introduction of

This is simply by way of introduction of a greater marvel yet—a marvel of marvels, so to speak, regarding the reproduction of anund. It is the application of the Poulsen

of this necessity, and has conceived the ingerious idea of powdering the steel disc with a finely divided magnetic substance—iron reduced by means of hydrogen—in the hope that this powder would collect along the magnetized traces left by the soft-from styles.

In these conditions, although at first the reinforcement appeared scarcely sensible, it was possible to prove that it existed, in a very original manner, at the wireless laboratory of the Hiffel Tower station at Paris. During the experiment signals from Cleethorpe and from Clifden were heard,

but the disc recorded only the first, which were the loadest. But, after the employment of the powdeted iron the Clifden signals were recorded.

Our diagram shows Mr. Dosne's plant. In includes a wireless receiver with a crystal detector; the telephone has been removed and explaned by an amplifier. Finally the Poulset telegraptione is conserned, in the place of the load-

speaking telephone, to the amplifier. In these conditions it suffices, to record a message received at an ordinary wife-less station, to start the steel disc rotating in order that the fluctuations of the content, passing through the combined telephones and miscrophones of the amplifier, may determine in the coil of the Poulsen apparatus a variable magnetic field, of which the little soft-iron needle constituting the core of the coil forms a part.

The message is read by placing the ear at one of the telephones of the Poulsen apparatus, which, after the registration, behave like simple receivers and repeat the

It should be noted that the speed of recording a message may be modified for expetition. In fact, the disc may be made to turn at a greatly reduced speed if one is not well trained in cound-reading; but in this case the signals lose in intensity. On the other hand, if the speed of reception is greater than that of record, the signals gain in power.

The same disc may serve indefinitely If it is not desired to preserve the record.

(A) America to preserve the record.

(A) America, (B) Crystal Detector.

(T) Faith (K) Fixed Goodenser. (K1)
Adjustable Condenser. (R1) Prime Receiver. (M1) Its Microphone. (R2) Secondary Receiver. (M2) Its Microphone.

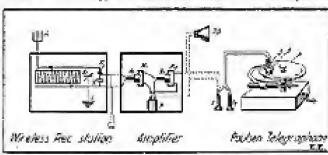
(P) Steel Plate. (B) Poulson Cod. (S)
Soft-steel Needle. (11-12) Receiving Telephones.

### THE SMALLEST LOOSE COUPLER.

What is probably the smallest loose compler ever boilt and suitable for actually receiving wireless signals is shown in the photograph. It is perceived resting on top



of the large coupler, which latter measures short 2 feet in length. The large coupler is fitted with three primary switches, and same is capable of toolog in wave lengths up to 0.000 meters when used with a fair-size zerial. The ministers instrument is



System for Recording Winelass Telegraph Signats on Telegraphone.

telegraphone to the writing and the recording of wireless messages. And as the roice is now being som over considerable distances by way of the other, it has to do, in its logical extension, with the human roice.

Contradictory as it may seem, this new method of writing and recording wireless communication uses recordless records—that is, they cannot be seen and reid by any of science's saids to the eyes. A wise is the only thing an observer may see.

is the only thing an observer may see.

The Poulsen invention, you may probably know, is a suggestic phonegraph which records sound vibrations, not by actual needle marking on a plastic disc, but by variations of magnetism in a steel disc. You can note the concentric lines made by the needle on a familiar musical record, but the steel wire used by Poulses looks precisely the same after a song or a senting has been stored up in it.

Imagine a dead piece of notal, with no visual indicating of how it is accomplished, holding human speech imprisoned in its cold confines and music and sound visal to the progress and collightenations of the profil.

THE VOICE IS STORED IN MOLE-CULES OF METAL. And best is a fasiling mystery in this storage. Precisely what the nature of it is man shall not know, we are told by authority, until mystery of magnetism is fully solved. The wirard responsible for the new and

The warard responsible for the feew and wonderful discovery is manual Dosde, and Lucien Fournier, in describing his achievement, naturally speaks first of Poulsen's earliest model. It was then constituted by a bebbin of steel wire which was made to turn under a receiving sell. The wire records speach magnetically and it is reproduced in a telephone receiver when the coil that has been inflammed passes a second time under this secoiver.

end time under this secciver.

The device used by Mr. Downe differs from this early madel by replacing the steel wire with a seed disc teening under a light soft-iron needle forming part of the electro-magnetic receiver of the apparatus.

This apparents moves from the edge to the center of she disc during the institution, so that the record is spiral, like that on a graphopheric disc.

The Postses device connut be used for recording wireless signals; the coil cranucted with the needle planned for use as a telephone record needs anotheration for adaptation to the new kind of work required of it. Mr. Dusce has taken account

CONCERNING GROUND

ANTENNAE.
It may be interesting for the antiteur radio readers of your magazine to know what success I am having using a ground artenna.

I laid two stretches of No. 18 insulated bell wine directly on the surface of the ground in my back yard (in Boston), the ength of each stretch being about 25 feet. The lead-in was taken from the middle, thus forming the shape of a "T." The instruments I use are a single-slide homemade tones, galena distector, 75-olum tele-phone receiver and an E. I. Co. loading coil. With this aerial I receive the Boston Navy Yard and a number of stations around the harbor. I had some coresspondence with an experimental radio station here regarding this "ground antenna." and they advised me that this type of aerial has a directional effect; that is, if it came due north and south, stations cast and west cames he heard. I advised there that my acriel runs directly sideways to the Boston Navy Yard and I receive messages right along from this station. They wrote and told me that my not encountering di-rectional effect with this ground antenna is due to one of two things—cities the wires are so far short of the proper length that I get forced oscillations, or else there are local electric prices that neutralize the actual direction of my wires. I shall be pleased to open from any amotion who experiments with this type of aerial. Contributed by P. J. LEARY. tributed by

### NEW ORLEANS RADIO OPERA. TORS MAKE FINE RECORD.

Complete ancess greeted the recent initial attempt of the radio operators at the New Orleans Naval Station to flash a measure to the Government wireless station at Darren, C. Z.

Darren, C. Z.

The test message was sent at 10 o'clock in the merning, and Chief Operator Mo-Kean, of the local massissation had no difficulty in communicating with the men in charge of the station on the Canal Zone. The distance between here and Darien is approximately 1,600 miles, and the operator on the Canal Zone stated that the signals from New Orleans were so attents as a parents affect the ear strains.

to almost affect the ear crams.

The sending of the long-distance message to the Panama Canal by the New Orleans Naval Station marked an epoch in Government radio circles. It means that the final link in a chain of mircless stations to connect the United States and points in the tropics, as well as our possessions in the Pacific, has been completed.

Two 300-font steel towers and an exceptionally powerful set contribute in making the New Orleans radio station one of the best yet completed. A force of 16 operators will be required in transling the radio equipment when the station has been brought up to its full strength, it is said. Most of the dispatches flashed through the air from the ships in Mexican and other tropical waters are expected to be handled directly through New Orleans.

so small that it will fit in the hand alcely without projecting beyond the fingers. It is complete in every way, being fitted with a primary tuning slider as well as with as primary tuning slider as well as with a primary tuning slider as well as with a primary tuning with comparatively fine magnet wire. This small coupler has been used a member of times and operates very efficiently in bringing in wireless signals, it is capable of tuning in wave lengths up to about 200 meters when used with a small-size antenna.

HOW WIRELESS WAVES TRAVEL AROUND THE EARTH'S CURVATURE.

M OST people probably do not stop to consider what a great depth of carth exists between two modern distance radio-telegraphic stations

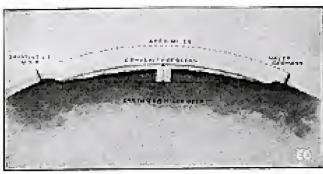


Fig. L. (Bastrating the Vast Dopth of Besth Hetwest Iwo Transationtic Redo Stations.

when they are in communication with each other as, for instance, is the case between Sayaille, L. L. L. S. A., and Nacen, Germany, Incaced near Berlin. The approximate distance between these two modern high powered wireless reasions is 4,000 miles and, as Fig. 1 shows, the convenes of earth lying between these two stations has a chord height of 318 miles. At either station the lofty steel towers supporting the aertal wires, from which the wayes are liberated or self out, only have a height of from 600 to 800 feet it any case. This, of course, is a very, very small percentage of the depth of the neith's curvature intervening between the two stations, as will be perceived,

Several theories have been brought for the from time to time in the progress of the radio act as to the probable method by which such their distance wheless telegraphic signals are propagated around one fifth and even ene-quarter or more of the earth's circumference. Many scientists closes that the waves glide over the surface of the earth, as shown in Fig. 2 at A A A. This is based on the consideration that the earth's surface acts as a charged conductor and thus serves to guide the waves so to speak, in their path between the stations. Ut course, the waves radiate, practically speaking, equally in all directions from a given point (as about an aerial) in the form of a circle. Only the half loops are supposed to glide over the sar-face of the ranth, as Fig. 2 indicates; the

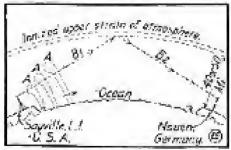


Fig. 2. Diagram Shawing Hew Wireless Waves Are Propagated their the Carib's Surface.

complement half waves of those shown being, or course, in the earth proper,

It was formerly believed in the early days of wireless telegraphy that the wireless signals were propagated between stations (which were lacated sufficiently far apart so that the east of one could not be seen at the second station) by means of what was termed the "lasmid" other, locked up or permeating the easth itself and also

AMERICAN RADIO LEAGUE
WIRELESS STATION.
By Fronk C. Perkins.
The accompanying illustration shows the

The accompanying illustration shows the equation to of the American Radio League relay wireless station. This station is in operation at New Rochelle, N. Y. The actival is of the imperied

artial is of the inverted "In type, having an average (two wire) beight of about 65 feet and a length of 180 feet. All the parts of the actual are extreme to well insulated and very strengly installed to prevent damage by wind and sleet. Standard phosphorbronze with and commercial insulators are used.

it may be stated that the transmitting set cousists of a 1-km. transmitter, with a condenser vapacity of Je6 unid. (Current

standard Navy (ass in parallel). The retary gap employed has 12 moving points and two stationary electricles and turns in \$,000 R.P.M. This allows the use of the above small condensers and gives the short wave necessary for \$00-meter work in the pri-

mary circuit, which together with close tuning through an efficient osciltation transformer, with tale locseness of coupling, allogs breay radiotion on a single peaked wave.

It is held that repeated tests show a transmitting range of between 350 and 400 miles under any sort of normal excellings. Un-

all other solid bodies with which we some in contact state.

According to the latest scientific theories of all bodies, even including cost item, steel, one, these really consist in great part of others electrons: the relative promotogy of solid particles is same baing extremely small. This theory was at one time

theory was at one time strongly advocated by the famous English scientist and investigator, Sir Oliver Lodge, After much research and especimental work, which has progressed sufficiently to

work, which has progressed sufficiently to give some basis upon which to stant, some of the leading scientists of the day, including Dr. J. A. Fleming and others, now bold to the reflected wave theory to become for long distance radio telegraphy.

This is supposed to take place as follows: As we know, the atmosphere of the earth, roughly speaking, extends upward to a depth of 40 or 40 miles. At these high altitudes the atmosphere becomes very highly rarefied and it is suspected that a very strong ionization of the electrons in these upper strata of the atmosphere takes place. This electrification of the upper strata is consed by the electro-imagnetic eigent of the sun's says, according to these theories.

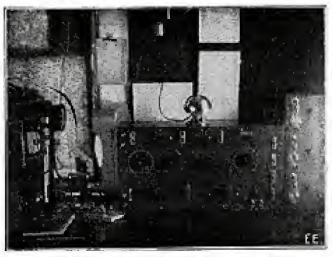
It is believed that considering such long distance radio transmission as 4000 males, the etheric waxes, as propagated from a station like Soyville, L. L. strikes commend, due to the earth's convenient. The waves are then reflected from the highly ionized apper strata of the annosphere; also it is thought for that the reflected wave, such as at B\*, is the one that is intotycoted at the distant rectiving station, say at Nagen, Germany,

der very good atmospherie countriens 800 to 1,000 miles is not at all difficult with this set. The transmitter is contained in a polished wood cabiner, a rusner of which may be seen in the extreme left of the picture.

There is a special loose coupler used for waves up to 3,000 natters of a little over. This loose coupler has a very long secondary of high inductance value, which permits runing without using much capacity across the secondary in that district; practically no capacity is used and this method has been found to permit of much longer distance in working, especially with audions. Also the loading cells used lead both primary and secondary, and particularly endeavor to balance up the sexualary circuit with the use of very little capacity. This method is use of the secrets of the semarkable sensitiveness of this set.

It is of interest to note that No. 21 wire is used for both primary and secondary of the loose coupler. A two-step amplifiest of the Andion type is used in connection with an Andion detector. This amplifies embodies some original ideas in its details of construction.

It is pointed out that there is an original arrangement of knob switches in the amplifier rivenit that allows (for the first



ing catternely small. This Extellest Rails Relay Station of the American Radio League, at New Rochelle, N. Y.

time in actual practice) a change from the receiving on the detector alone to any step of the amplification instactly, without semoving and replacing belophones or discretizing any adjustments. Tals method of producing histograms amplification and the reverse is of great convenience and importance. The whole station was designed with the idea of service on long-distance radio "relay" work, and is remarkably efficient in operation. A comparison of effects may be ised by noting that Key West santion, NAR, can be heard and equival easily a feet from the ordinary telephones, while Arlington, NAA, has been copied over 100 feet distant from a buol-speaking telephone when this was booked up in the circuit. Regular work has been done with stations using 1-inch only at a distance of nearly 50 miles.

#### TO INSTALL WIRELESS AT CHICK-ASHA, OKLA, HIGH SCHOOL.

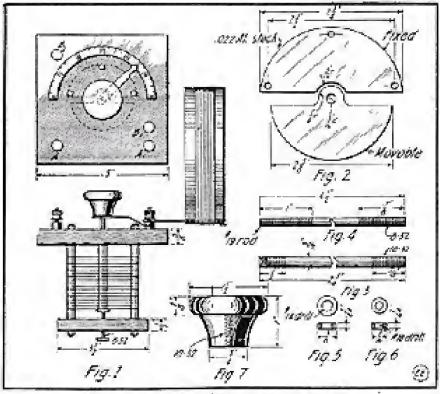
The Chickasha (Okla.) High School will install a wireless relegantly dispatching and receiving station for use in the school work. The station will have sufficient power to receive mestages from the Arlington wireless spation at the Eastern coast and from sides 300 miles out in the Gulf of Mexico. The station is now tendy for harders.

## How to Build a Wave Meter

By Samuel Cohen

M ANY radio experimenters have an idea that the agreementor and manipulation of a wave meter is a difficult matter and therefore they do not equally build one. However, the construc-

dimensions, as shown in Fig. 2. The socary plate shaft (3 in inch diameter stock) is shown in Fig. 3 and stationary plate rock, of which there are three, are made in the same manner, as is shown in Fig. 4. Two



ligitally of Wave Meter Configurer and Jeductonees.

tion and operation of a wave meter is so single that the novice operator may use it.

First and foremost, a wave meter is an instrument comprising an inductance and a variable espacity and an indicating device, such as a telephone receiver of vacuum tube.

This article deals with the construction of a wave meter, which was recently built and calibrated by the writer. The builder of this instrument does not accessarily need to calibrate his wave meter, but he should construct it according to dimensions given.

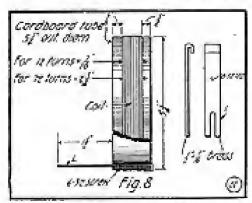


Fig. 8, Industrance Colf Makestly.

The writer advises the consultation of a good text-book treating on the manipulation and construction of these meters before building such an instrument.

The first thing to build is the condenser, which is of the recary nir dielectric type. Very little explanation is necessary for the deteription of this condenser, as all the details are plain and self-explanatory. Fifteen rotary and 15 fixed plates of Ne. 20 B. & S. gauge aluminum are made according to

sets of mashers are constructed, gamely, she recary place washers, as shown in Fig. b, and the stationary place washers as Fig. 6 illustrates. When all these parts have been made accurately associable.

these parts have been and accurately assemble the conserver. Fig. 1. The rotary places are regulated by means of an 8-72 set arrew. The knob. Fig. 7, is made of any instability parerial, preferably hard robber.

This variable combined has its 180° scale marked off in 26° regal divisions. Its maximum expectly with the retary place notably intermedical with the fixed places is 500035 migro-farads. At 15 scale divisions the dapacity would be half this value in microfarads. The wavelet is 18 can be calculated from the usual formula:

W.L. in meters =  $59.6 \times \sqrt{L_{\rm s} \, \text{cms.} \times L_{\rm s} \, \text{m.i.}}$ 

We now come to the inductance coils, of which there are two. These are shown in detail as to their nake-up at Fig. 8, and some substantial cardboard telong or worder rings are to be used, which have an exact entside diameter of M inches. Two such "focus" or rings are recessary and the simpler undertance and consists

industrance mill convisive of 12 turns of No. 20 B. & S. conmoled magnet wire, wound on very evenly, with the

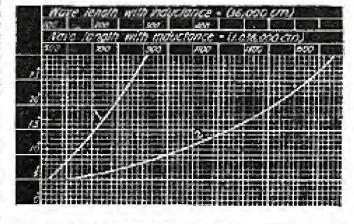
thems close together. The second or larger cort consists of 72 turns of the same size magnet wire, wound on evenly, with the turns close together. The coils may receive a few costs of black shellar to help hold the windows turnly in place. It is also a good idea to bind the coils with white lines tope or with cord, so as so protect the wire from lajury.

Both coils are provided with two trass or copper attachment straps 1. The drawing at Fig. 8 indicates how these plugs are attached to the card hoard tubes by simply bending one end of them over as indicated, and a No. 6-92 machine screw is passed through a hole in the other side of the cordboard ring into a tapped hole in the brass strip. These strips should be about 115 inches again, and the two terminals at the coil is either case soldered to them, one remainal as each plug. The slots in the each of the strips are break, of course, to the 3dming past of the agree meter at A', B'.

These inductances correspond to those

These inductances correspond to those made by the writer and which are designed from stamberds as made up and tested on a Signess & Halk's inductance bridge at the tradio faboratory of the College of the City of New York. The small or 12-turn call has 20,000 cms, inductance, while the 72-turn coll has 1,035,000 cms, inductance. Fig. 9 depicts there correspond to 100.

Fig. 9 departs three variets plutted (or different wave lengths, corresponding to different concleuser resultings. Carried was plotted with the small inductance coil, while curves 2 and 3 represent the use of the large inductance coil. It is very easy then to determine the resonance points of the wave meter by reading the scale setting of the condenser had referring to the curves herewith reproduced. Care should be taken not to use the wrong curve, as they have entirely different traines.



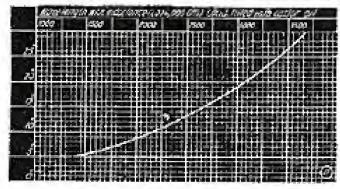
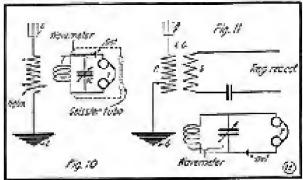


Fig. 4. Wave Length inductance and Capacity Curves for Use With Wisse Meter.

The curve No. 3 was plotted for these descring to measure waves up to \$750 mm-

ters in length or more. To use this surve and its convalent wave lengths as given, the variable condenses of the wave meter must be placed in a glass or other jar, so that the moving and fixed plates will be immersed in castor oil. This raises the capacity of the concluser about five times, and hence gives us greater wave length



Figs. 10 and 10. Olograms for United Wave Meter on Trans-mitting and Receiving Circuits.

ranges with the same inductance coil, L &, 72-men coil, with 1/36,000 cms.

The diagrams at Figs, 10 and 11 indicate how the wave meter is hoosed up. At Fig. 10, used, say for measuring the sending wave length, the inductance coil I of the meter is held just close acough to the sending helix so that a readeble sound is heard in the telephone provinces T. The variable constenser is regulated or turned until the loudest signals are beard. This is the loudest signals are beard. This is the point of resonance in the wave meser citpoint of resonance in the wave meter cir-cuit, and the corresponding wave length value for this setting of the condenser is read off from the curve 9. If the condenser reading was, say 20 degrees with the large inductance coil in use, then by noting the wave length vertical line intersecting the curve 2 (for large inductance) and the (air) condenser horizontal line, it is seen that the wave length is 1,480 outcos-

In a similar way the wave length is measured at a receiving station (see Fig. 11). The wave meter industance coil is placed in sufficiently close proximity to the loose coupler coils until the incoming sigtalls can be heard in the meter 'phones, The variable condenser is then seried until the signals are heard loudest and this condenser setting in degrees, referred to the curves in Fig. 9 as explained above, gives the equivalent wave length in meters.

Andther common method in vogue for measuring received signal wave lengths is as follows: When a certain station is named in sharpest on the regular receiving. set the instruments are left alone as they set. Then the wave meter is brought near the coupling etc., and by exciting the wave meter circuit (by connecting a heaver vi-brator across it) it is possible to hear the meter oscillations by influction in the phones of the regular receiving set. When the meter signals are leard condest, then it is set to the wave length corresponding to the setting of the receiving apparatus

From the data here given it is possible to easily build a wave meter with any rotary condenser, using the standard inunctances here cited.

## LOADING COIL MOUNTED ON SLIDER.

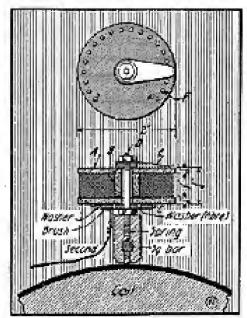
A ministure leading coil which is placed on top of the loose coupler slider can readily be made, and at the same time have a fairly large wave length. This jasteument has been tested out in several com-mercial radio stations very successfully.

By referring to the drawings herewith, given the construction will be quite evident. First comes a circular form A. Fig. 1, which is made of some involuting restersal, preferably hard subber, and turned out in a lathe. The dimensions are given. Next mark out a circle having a radius of 1% inches and on it lay out evenly 20 points. and then set in them 20 brass mails having de-inch shank. After having there this obtasin a 1-inch braze or copper washer C and mount it carefully on the circle, as shown. It is fashened in place by

means of three brass screws. This ring is used to connect one of the end connections of the winding by a brash, as

A 34-inch hole is next deilled in the center of the reel A, and into it force a brass rube % fuch long having an internal, character of the inch. Into this brass tube the shoft D is placed, which is made from brass stock, and details are shown in Fig. 2. The contact maker is now made as in drawing 3, which is then soldered to the simil as

New, being frielded with all the saccesary details, the winding is next to be considered. There are 20 sections to be wound on the coil. The first winding consists of 10 turns of No. 36 D. C. C. magner wire.



Leading Coll Mounted on Tuner Sider.

The one end of this gold is brought to the brass washer C and family soldered, while the other and is soldered to the shank of the first brass tack. The second winding consists of 15 turns of the same wire, and the connections are made with the first tack, while the other joins on to the second tack. All the other windings are made in the same way, and each winding is in-

The shaft is then screwed on the slider and carefully adjusted to see that the cold cotates easily and that the switch blade makes contact with each point. Now connect the actial wire to the brush

binding post, while the soil end wire Joins the regular receiving circuit. By turning the real the wave length is regulated, and also the slider can be moved back and forth. This method of tuning is very ellielent and at the same time saves some space, besides enabling two operations to be accomplished by the band in one posi-

This decice has been developed by the Eugene T. Turney Co., which has patente pendling on this

ELECTRIC VARNISH.

Powder some common scaling was in a morear, place the fragments in a bottle and cover with alcohol. Keep in a warm place until all the scaling was is dissolved. This varnish may be used to cover magnets and other parts of electrical apparatus.

Electric Coment.

Melt equal parts of becawax and notin together and stir in one fourth of their weight of red other, stirring until well mixed. This coment is used for fastering the nectal postions of electrical instruments to their insulating supports, etc.

Contributed by ALEXANDER V. BOLLERER.

#### THAT LIGHTNING SWITCH.

Every grand amateur wheeless station has a fightering smitch to ground the aerial with. The swinds is used because it dissipates static aerial currents before they have had time to aroundate into a heavy charge, and thus prevents damage to the building аны жиригайдэ.

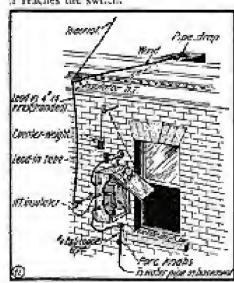
The wire from the sucien to earth should be a No. 4 B. & S. (about 14 inch diameter) cooper conductor, connected on the outside of the building and taking a straight

course to the ground proper. This "ground" should consist of a 12foot by Isinch diameter from pipe driven into moist earth, or a 10-inch square piece of copper buried 6 feet deep. Some amateurs use a connection made to a wellpump (iron pipe), but in any case the con-

nection must be soldered and taped. A 100-ampere, 250 or 500-volt S. P. D. T. switch is specified, with the aerial connected, to the blade, the ground to one jaw and the apparatus to the other jaw. This the apparatus to the other law. This switch may be obtained from any electrical supply company, but in order to stand the sending voltage the base should preferably be made of merble or porcelain. The cheapest way to do this is to buy a slatebase switch and semount on marble your-

If the aerial proper is composed of four No. 14 copper uires, that the lead-in should consist of fear No. 14 copper wires or a No. 6 B. & S. solid wire, stranded cable being best, of course.

In order to protect the switch from being hepiten, it should be fastened with screws in a box with a hitaged cover, and the lead-in fastened by an insulator before it reaches the switch.

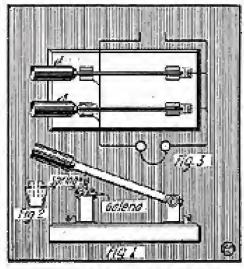


Practical Method of Installing Lightning Switch.

Rain can be prevented from running down the lead-in by making a ball loop in it. Contributed by W.M. R. COTTRILL.

#### AN REFICIENT DETECTOR.

I give herewith sketch and description of a simple yet efficient detector, made from a double-pole single-throw switch, which I am sure will be found useful to the smatter,



Detector Muse From Knife Switch.

Procure a double-pole, single-throw knife switch; unserew the hinge post and place a washer between the base and post, so as to allow the switch blade to be swang from side to side to facilitate the adjustment. Hefere replacing the switch blade, solder on in a fine wire coil of either phespher-broase or brass, to make consact with the crystal. Now take jaw post and bend it into shape to hold the crystal, as shapen in Fig. 2.

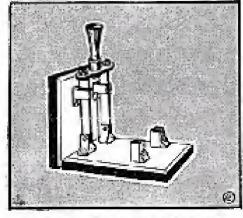
This completes the desector; the other switch being used to shoot-circuit the de-

This completes the detector; the other switch being used to short-circuit the detector while sending or it may also be converted into a detector. If the constructor has means of short-circuiting the detector on the acteura arcitch, and those not need the added detector, he may use a single pole, single throw switch, and will not have to change blades, as in the case of the double-pole, single throw switch, where the double blade will have to be substituted by the single blades. Connections are shown.

Contributed by WILLIAM GUIER.

### A HANDY AERIAL SWITCH.

The following instructions will be found, very serviceable for constructing an efficient and simple perial switch at a very nominal cost. This switch may be thrown



Agulat Switch Composed of a D. P. S. T. Knile Switches.

from transmitting to receiving, and vice-versa, very quickly and satisfactorily.

Obtain two double pole, single threw switches and from our remove the arm and place the lags over the arm and lugs

### A HOME-MADE TUNING COIL.

The amateur is often hampered by the lack of funds and therefore the tuning coil herewith described will be found beneficial in overcoming this embarrasament.

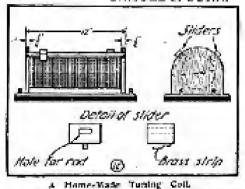
First a cylinder 4 inches in diameter is

made from cardboard and epated with parafine to insuse periest invulation, or, letter still, a wooden cylinder may be used. This cylinder should be 11 inches long and would with a layer of 20 to 22 copper wires with outloo covering. (linearly wire with also be found effectual). A rod is now heated see lost and drawn along the coil, thus burning off the cotton insulation in two straight lines, each ahout 35 inch wides these bare strips forming paths where the sliders make contact. For enamel insulation sand paper serves to remove the contag along the slider paths.

A convenient size frame of %-inch stock

A convenient size frame of %-inch stock is then constructed, across the crids of which are placed two brass slider rods, with a slider on each. These sliders are made from pieces of brass or supper with holes to fit the rod, contact being produced by fast-colog (soldering) a strip of spring brass or copper onto the under sider while at the top a piece of lard rubber should be firmly fixed to prevent the coil from being grounded through the hody. (Sliders can be purchased were cleaply from any supply house). The hinding posts can be proceed from old dry cells, and in the drawing breewish is shown the make-up, there being four terminals. By properly following the above directions, good results may be realized with this roik.

Contributed by SAMUEL F. DUNN.



## SMOKE STACK SUPPORTS WIRE-

LESS AERIALS.

The hig smoke stack at the Brush Electric Co.'s power plant at Galveston, Tex., was probably never intended by its designer to be used as a mast to hold wirebess acriels, but it has proved a wonderfully good thing for the purpose, and mestages are now being transmitted from the top of the worke stark to points as far away at Vera Crist.

stack to points as far away as Vera Crue-Except for the waveless on the army transport Buford, which was in continuous operation all through the recent storm, the Marcotti wireless plant at the Brush powerhouse was the only wireless in the city connection Galveston with the outside world.

house was the only wireless in the city connecting Galveston with the outside world. The Marconi aerials wert down during the height of the storm and Manager Camphell immediately got bosy looking for another place from which to operate.

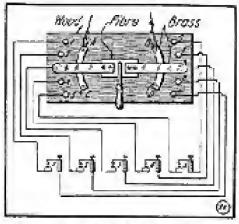
of the other. Then tighten so whatever pressure desired. Set the switches at right angles and fasten to either a wall or table. If desired, a special base may be made for this purpose, as sketch indicates. This should be composed of a block of wood, while states inches long, serowed at right angles to another block, \$\frac{1}{2}\text{3}\text{3}\text{3}\text{5}\text{ inches long, serowed at right angles to another block, \$\frac{1}{2}\text{3}\text{3}\text{3}\text{5}\text{2}\text{1}\text{2}\text{5}\text{ inches long, serowed at right angles to another block, \$\frac{1}{2}\text{3}\text{3}\text{3}\text{5}\text{2}\text{5}\text{2}\text{inches long, the corners of which may be beyelful to produce a peater effect. Contributed by

D. K. WALKER.

### A HANDY DETECTOR SWITCH.

I have found the following switch very desirable for throwing one of a number of detectors into circuit.

This can be easily made by placing some exploded cartridge shells on a worship base, as shown in sketch, and connecting these to the two pieces of brass by means of the brass strips, indicated in electch



Unique Butcober Switch.

attached. The shifting brass strips are riveted onto a piece of sheet fiber, through which is bared a hole. A not is passed through and connected to the wood base. It is then bent, and if desired a handle may be attached.

The figures from 1 to 5 represent the bullet shells and numbers of detectors; and the letters A, B are the connections for

the phones and instruments.

Contributed by GORDON SCHAUB.

#### A SIMPLE TUNER SLIDER.

The following articles are required to make this handy limbe slider;

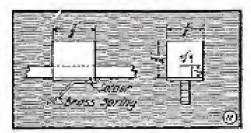
make this happy unite stider:

A piece of hard wood % in, x % in, x % in, x % in, in which a groove % in, x % in, x sie cut to allow slider to pass through. A sheet of tin or copper % in, x % in is fixed over this groove, and screwed or stailed on, as the constructor sees fit. On this is soldered the slider contact, which has been properly shaped and a % in, projection allowed, in order to make contact with rod.

This slider works very easily when the slider contact is made of a thin but flexible piece of brass or phosphor brown. The hard wood handle is now given a cost of shellae and the slider is really for use.

Contributed by

CARL LINXWEILER.



Tuning Coll Silder Made from Wood,

### THE CHAMPAIGN, ILL., WIRELESS CLUB.

The Champaign Wireless Club, of Champaign, Ill., was organized Aug. 4, 1915. It has nine members: Maurice Lee, president: Walter Thurnhill, sice-penident: Joseph Tipiword, secretary; Esnest Mills, treasurer, and T. Mollown, S. Hall, S. Bostic, O. Bucker and N. Chatman.



The department will award the following monthly prizes: FIRST PRIZE, \$3.00; SECOND PRIZE, \$2.00; THERD PRIZE SLOP.

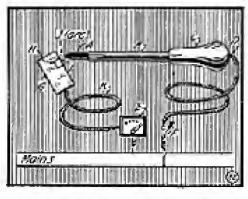
The idea of this department is to accomplish new things with all accompany or old natural, and for the most negatile practical and original idea cumulated to the Editors of this department, a monthly series of prizes will be awarded. For the best single submitted a tribe of \$3.00 will be sixen; for the second best tipes a \$2.00 prize, and for the third best a prize of \$1.00. The article used not be very claborate, and rough should be affected. We will make the mechanisms

#### FIRST PRIZE \$3.00.

### AN ELECTRIC SOLDERING IRON.

The following is on electric suddering icon that I have found very useful and particularly accessible for niches, corners of tight places, as well as for use in ordimary roldering.

M A is a small earlier pencil, forced into the end of a supper tube B C is a small wooden file bandle, drilled out, so that the copper tube can slide in snugly.



Arc Type Electric Soldering Iron.

A: D is seen a single covered conductor, saldered on the copper tube B. A smooth variable resistance coil to regulate the correct is deported at E, while F shows a switch for breaking the circuit. G is the piece that the article 11 is to be sel-dered to and 1 represents the soldering this; or if desired, solder may be used with acid, provided a small piece is cut off and placed on the article to be sof-dered. At J is shown the "are" formed by closing the circuit and holding directly over the article to be soldered. K is another insulated wise to be grounded to

the article being soldered.

This from may be made either large or small, as the milder sees fit. I have had fair states with it and feel sure that other amateur's will also find it efficient.

Contributed by

HAROLD SPAULDING.

### TO BORE HOLES IN GLASS.

The following method of making per-forations through glass may be of interest; Take an old triangular his and break off its tip about '5 in, from the end. Place the shank and of the file in a brace and use it as a drill. The glass should be drilled showly, using berseene as a lubri-

arult, but after once starting the simps of the file causes it to act as a reamor.

Contributed by W. R. COTTRELL.

At first it may be found rather dif-

#### FURNITURE POLISH.

Herewith is submitted a formula for making a cheap insulance polish, which will be found very efficacious: One-half gallon gasoline, 14 gallon light lubricating oil, 2 drops of call of certar.

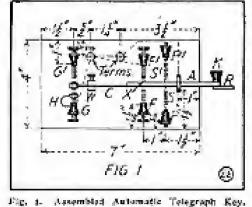
Contributed by MONROE MILAN.

#### SECOND PRIZE \$2.00.

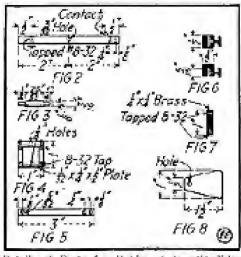
## AN AUTOMATIC TRANSMITTING KEY.

I give below a description of an autoenative key, which, although it may appear complicated, is really very simple. The arst consideration is the lase.

is made of oak 4x7x3\$ inches, with ten th-inch holes, drilled and countersunk, as shown in Fig. 1. The lever A. Fig. 1. is composed of a Si-inch appare brass end. drilled and capped, as shown in Fig. 2. The contacts N and F (Fig. 1) are for doshes. A small silver piece about N juch in diameter is splitered to the center of the lever, 16 inch from the end at "X." other contact is soldered to the screw in the post F. Two suches from the end a A-inch.



hole is bored, and into this is ferred a steel pin, as Fig. 3 depicts. This pin forms the pivot which carries the lever. The bear-ings are shown in Fig. 4, while R. Fig. I. is a piece of Beinch hard subber or fiber. sheer, finished as illustrated in Fig. 8. This



Details of Parts for Making Automatic Tele-graph Key.

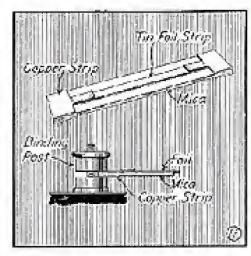
is fastened to the lever by an 8-32 screw 🐾 inch long. At K may be seen a hard radder key konde.

The spring C, Fig. 1, is made of phos-

#### THIRD PRIZE \$1.00.

## FUSES FOR BATTERY CIRCUITS.

A small fuse for battery circuits may be made of a small piece of tim-foil. The timfoil is out in the form of a narrow strip and connected between two binding posts, his size will vary according to the current it has to carry. Contributed by W. R. COTTRELL.



Buttery Foses Made from Tim-Foll and Mick.

phor bronze about No. 32 or 34 B. & S., and nocaspres 338x16 inches. This makes contact with a A-inch diameter sound piece of silver, soldered into a bruss cup and holted on to the spring through a desired diameter hole. The weight W is made of bear, laxingly inch. A slot is sword in the center of the bottom it inch deep. A ser-screw is then placed in one side. spring H as a U-shaped page of phosphor bronze I fact long and th fach wide. On one side of the "U," the silver contact is soldered and a shemon hole is drilled in the other sade. The suring is designed by passess of an 8-32 screw to the post G. The four posts F. F. G. C. Fig. 1, are each 1 inch long by M inch square, as shown in Fig. 7. A M-inch hole is drilled 15 inch deep in the bostom of each and tapped for an 8-82 serew. Four 8-32 serews, with knowled heads and look mass about I inch long, are required for these posts. The posts P and P, Fig. I, are similar to the others, except that a hole for inch in diameter is deilled through the post at the top. The series to which the springs are fastened slide in these holes. The two screws are without heads, but are fated with knurled lock muts.

The springs S and S'. Fig. 1, are made of No. 25 phosphor bronze wire. They are 14 inch in diameter and 15 inch long. One end of each spring is attached to one of the screws and the other end to the Bewer.

Connections are made between the posts F' and G and one hinding post; also be-

tween the lever bearing and the other binding post.

The speed at which the signals can be made may be varied by moving the weight W along the spring.

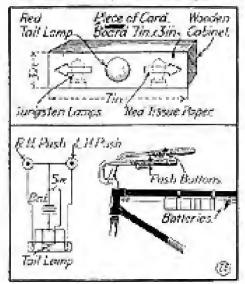
Contributed by J. L. GMEEN.

#### "SAFETY FIRST" ON THE MOTOR. CYCLE.

Here is a sample little attachment, the employment of which will insure riskess of motor vehicles against accident when turning sharp corners or when driving through dark roads in the country, or otherwise. This device constitutes a "red" tear lamp and two red arrows, which are brilliantly illeminated by the couch of a button. The

construction is as follows:

Pirst make a small-sized woulden calabett about 78888 inches. Take a giece of cardboard out to the above dimensions, and with a sharp knife our cut, with the aid of a rater, two arrows, leaving a square space in the center for the rear light. Then procure some red tissue paper, or better, work and glass and glass firmly against the frame of the acrows and rear lamp on the cardboard; cover and allow to dry. Now serew in these minimume temp receptables in the bese of the cabinet; fasten the lamps, make



Electric Signal for Yail-End of Biopeles and Minorepoles.

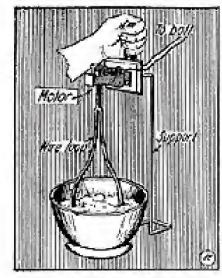
necessary commercions and tack the cardboard cover on the frame of cabinet with carper tacks. The wiring is very simple and the battery may be clamped on the main bar. Two push-hartons, as used on automobiles, are atmelled to both hardless. bars and set in commercian with the corresponding light.

Whenever it is desired to mun in a carmin direction (either eight or left) the corresponding (attom is pushed); the light darge up and any approaching vehicles or pedestrians are informed of the intentions and reherenhouse of said motor vehicle, thereby obvicting all danger. Contributed by WILLIAN WARTON.

#### SIMPLE ELECTRIC EGG BEATER FITS ANY BOWL.

A very simple electric egg heater can be made at home and at small expense, as shown in the drawing. The egg leater is an prostageted that it fits bowls of varying sizes, thus adding to its concenience and effectiveness.

All that is needed is a "toy" electric motor and three pieces of stiff wise. One riese for a handle, one for the blades and the third for a leg or support as shown in the illustration. The motor may be operand by try battrees as may be attached to the electric light system in carcuit with a "bell-ringing" transconner. If batteries are used they should be placed on a shelf or on the back of the table attached to the



Home-Made Electric Egg-Beaten.

motor by a flexible wire of sufficient length to allow the heater to be used on any part of the table. A small switch should be placed on the motor or within reach of the le [g ha nó.]

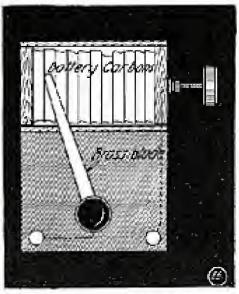
This muchine will beat any counter of eggs in a very short time and a does not get "tired," Committeed by

HAMILTON A. HOOPER.

#### A USEFUL CARBON BATTERY RHEOSTAT.

Anyone desiring a cheap has extremely efficient character will find that this one will exceed their expectations, both for simplicity of quastruction and for efficiency

is the regulation of hattery current. All that is required to build it is a hard wood baseboard, a number of flasklight of other hattery carbons and a switch handle. The earliens are placed in a rectangular compartment made by screwing small strips of wood on both sides and ends of the space they occupy. A strip of wood may be laid across the top to prevent them



Old Battery Cogleson Form Uneful Rheoniat.

from being forced out of place. A hole is then drilled on one side, into which a threaded brass rod is tightly fitted. This cod must have a knurled thurst out with which to turn it. A brees out should area he put on the rod, to which is soldered the wire for connection with the binding post.

The switch bandle is now placed in the conter of the remaining space; a block of sufficient thickness being set ender it to bring it on a level with the upper surface of the earliens, i.e., with the end of the lever resting on them. Any number of cachees may be used, but it has been found that the more employed the more sensitive will be the regulator.

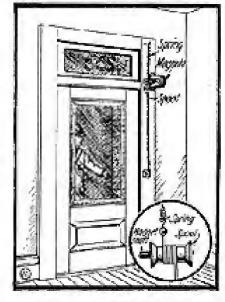
The regulating screw must come in contact with the carbon sear it, or the connection may be made from the carbon stack; By sliding the lever over the carbons, different resistances may be obtained nicely, while the screw serves to adjust each stepwielt fine précision.

Contributed by

SELMER WICK.

#### THE MAGNETO ELECTRIC DOOR BELL

The disadvantages of the common electrie door bell often outweigh its advan-tages. The batteries are continually runping down, due to excessive use or a short. circuit, and the button seems to be an irresistible temptation to every youngster



A Magneto Door fiell Saves Buiterfet-

who delights in saidking a pin in it to keep the bell ringing. Although the bell-ring-ing transformer does away with battery trouble it leaves much to be desired. To eliminate all these mistages i large

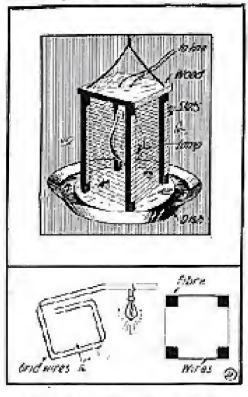
designed an easily constructed magneto-door bell. Purchase a second-hand magneacto and a polarised bell. Remove the two leases gears from the uniqueto and put a small speed on the shaft of the mag-

The magneto is mounted above the door as per sketch and a bord fastened to the regidar pull hell is passed around the speed acycral times, a tack is driven in to 2000 it from slipping and the free end of the cord is fastened to a strong spring, however into a screw-eye, and serewed into the top of the door frame. Wires are sen front the magneto to the bell, which is located in any convenient place. These weres may be make small, as the bell will ring through an enormands resistance.

A study of the diagram will show that a pull on the handle of the bell will spin the magneto armature and when the bundle. is rebrased the spring will pull it back, ringing the beli in both cases. Contributed by THOMAS W. BENSON.

#### ELECTROCUTION TRAP FOR INSECTS.

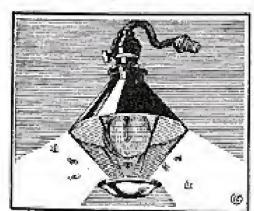
A German inventor has devised a very interesting electrocution trap for inverse. Upon an insulated frame of either prismatic or globular form two naked metallic



One Type of Electric Inject Destroyer-

conductors are called in a spiral with about re inch or less space between the withings. The two confidences are connected with a source of electricity in such a manner that the correct council disculate antil it is actually used in killing an insert. is one of the advantages of the apparatist obviously no electrical intergy is wasted.

Insects are attracted either with sugar water or any other sweet substance, he night time electric lights can be used. The glore of shining metallic parts will also serve as an additional attraction. As soon as the insects touch the bait or the light, and came in captact with any two of the naked wires, they are electrocated at once and deep down to the bottom of the trap. The current passes only for an instant and is very feeble.



Another Form of Electric Insect Trap.

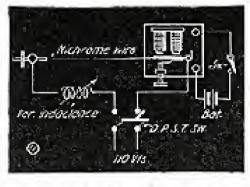
The yearth herewith depicts how, with a few pieces of horn fiber soil earsains the net of twin verses, with a lamp inside it, one of these teacful devices can be made. A tin pan can be fastened to the bottom of the fiber strips in which to eately the dead insects. The top support east be of wax-impregnated wood or of fiber. Slots

should be out in inch apart in the strips to accommodate the two bare wires. No connection exists between the wires until the insect "crosses" them.

Our second illustration shows a similar myle electrical insect trap or againtlator, and in this case the fiber or other strips supporting the two parallel, oppositely charged electrical conductors are tapered as shown. At the base of these fiber opnights supporting the two charged wires is suitably escaped a small cup, in which honey or some other insect delicacy may be placed. An electric bulb, as usual in this class of apparatus, is placed inside the wire cage as in the previous design de-scribed above. A single switch may control both the light and the grid wires, as hocomes evident.

## MECHANICAL WAVES MADE, VISIBLE ELECTRICALLY.

The following is a description of a novel and very interesting experiment, which is very easily performed, showing the ctationary mechanical waves on a heated elec-tric wire. Resistance wire is used to render it luminous, therefore the rosen should be darkened to obtain the best effects. I have tried two sizes of "Nichrome" whee; No. 19 gauge, of which about 12 feet was used, and about 6 feet of No. 24. The exact length for 150 volts may be determined by the experimenter; or, better still, a variable impedance coil may be used, in which event, the length of wire abed ant



Making Mechanical Waves on Wire Visite.

be so exact. At any rate, the wire must be between a dult red and a white hear. To produce the motion of the wire a larger is used to set up mechanical waves. Not having a busser on hand I used a bell with the clapper rod out off as short as possible and the end best to form a book. The resistance wire is fastened to the hook, where one side of the 110 volt circuit is posmecaed. The wire is stretched out to the desired length, where the other side of the circuit is connected; the hapedance coil being in series with it, as diagram

The switch for the buzzer circuit should now he closed and the room darkened. By means of the adjustable impedance coil for glater switch the wire should be raised to the desired temperature and tightened apagain, as it expends when heated.

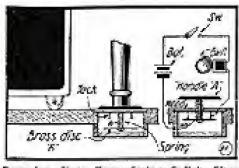
By varying the tension of the wire the waves may be observed. When the correct tension is obtained it should be kept constant. The loops or anti-nodes, and nodes of motion can be easily seen. The keep is of motion, can be easily seen. the maximum of motion, which is egsily observed, as it coals quicker and will be at a 'ged lead' when the node is "white."

During the course of one experiment the wire broke. In my haste to repair it I made a loose joint. The resistance of the joint being high, it became lunshous, while the rest of the wire remained invisible. The fantostic shapes and figures entenating from the impeture produced a very beautiful and spectacular effect in the darkened

Contributed by R. E. RYDERG.

#### A "SAFE" BURGLAR ALARM.

Its mechanism is so simple and accurate that it can be thoroughly relief upon. The July thing necessary is to chirel out nearly one of your foor boards near your safe of valuables, about 2 inches in length. To make the skylet, but a hole in a block of wood hig enough so as to admit rod "R" as shown. On the top end lasten a hard rub-



Remouving Chair From Spring Switch

ber disc "A." At the bottom end a disc of spring brass. Fasten two common tacks ann make necessary enumerious. Explanation: Place a chair on the side of your safe as shown in figure so that one of the legs rests on the top of "R." You have now set the alarm. As soon as the introder comes to the safe he removes the innocent looking chair, which naturally is in his way. and the pressure of the spring in the device consequently pushes up the shait, wherethe hell and closes the circuit. But the initiated can remove the chair as he pleases, provided the switch is off.

Contributed by

JAMES BERK.

#### TO RENEW DRY CELLS.

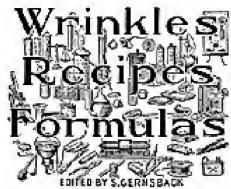
Dry cells, if not too far spent, car be received by drilling (not penching) a hole (A) between the binning peats (B-R) and pourting chemically pure ammonia into The hole is then scaled up with wax and as efficient service as when it was new can be obtained from the removated



McDell of Revitalizing Dry Colle.

The ammonia will cost little if brught in ions at a time and preserved for

filling use. Contributed by A. BEL JEA.



Under this heading we will publish every month useful information in Mechanics. Electricity and Chemotry. We shall be pleased, at course, to bare our conferences send as any recipes, formation, which have ideas, at a said to the experimenter, which will be duly paid for, upon publication, if acceptable.

#### FORMULA IS. Blackings for Boots and Shoes.

1, French Passe for Pasent Leather .- Take 6 dem. of Pase Wax, 2 or, of Obve Oil. The wax has to be melted in a water bath. Mix thoroughly by stirring; heat moderately. Add is on of Oil of Impen-ting and is on of Oil of Legender. The mixture will form a paste, which should be put in hoxes before it becomes cool. Agply with a linen rag. A very good paste, which keeps the leather rojs and restores she glock

2. Derating for Tan Shorz.—Take 1 oz. of Amosto, 1 oz. of Gambage, 1 oz. of Acacia, 2 oz. of Hydro-thloric Acid. Add water enough to make

49 manaes.

49 names.

3. Palish for Tan and Russes Sheez.—

1 nz. of Dark Yellow IVan, 3 oz. of Oil of Turpentine, 1 oz. of Palm Oil, 15 min. of Oil of Mirban: Melt the wax and oil together, add the oil of Mirban.

4. French Boot Blecking.—Dissolve 150 over of West and 15 name of Talkan it. a.

4. French Bost Blocking.—Dissolve 15th parts of West and 15 parts of Tollots in a mixture of 200 parts of Linguist Off, 20 parts of Linkered Off, 20 parts of Linkered Off, 20 parts of Linkered of 200° F. After this add 100 parts of Lampblack. When eval dilute the mixture with 280 parts of Spleits of Turpentine, and finally mix with a balation of 5 parts of One: Lac and 2 pirts of define Violet in 35 parts of disolot.

5. German Bost Blocking.—Melt together 90 parts of Ceresine (or Beerman), 30 parts of Oli of Sperimenen, 350 parts of Springer of Parts of Springer of District Off parts of Barrar, 20 parts of Lampbiack, 10 parts of Barrar, 20 parts of Lampbiack, 10 parts of Barrar, 20 parts of Lampbiack, 10 parts of Prastion Blue, 5 parts of Nitra-Benzal,

tion Blue, 5 parts of Nitra-Bensel, 6, Self-Shining Blacking.—Dissolve 8 ox. of Gum Ambic in Soz of best Black Int; add 2 oz of Olive Uit. Mix thoroughly and then add 4 oz. of Strong Physics, 3

oz, of Brazen Suger, 2 az, of Alfahel, 7, Waterproof Blacking.—Melt together 3 oz. of Beenman and 3 oz. of Bisch Resin; then stir in 1 pt. of Boiled Oil. When it has could a little and 8 on of Oil of Terpenting.

E. Russian Matertroof Boot Blacking — Mich too. of Breswer. Vs oz. of Sunt, 2 oz. of Office Oil. Add Vs oz. of Lampblack and stir till cool. Warm the boots with

apply the blacking.

9. Liquid Shot Blacking,—5 or of Anti-mal Charcood. 4 or of Melastes, % or. Sweet Old. Tringrate must the oil is thor-oughly incorporated, then stir in % part of

Pinegar and M. pint of Boer Lees.
16. Finishing Blacking.—Mix topother Vor, of Gelatine, Vz or, of Indigo, 1 or, of Logwood Extract, 2 or, of Crown Surp, 3 or, of Softened Glie, 1 qt. of Vinegar.

#### A GOOD SILVER-PLATING SOLUTION.

This solution will be found of excellent use in silver-plating different parts of electrical apparatus, jewelry, etc. Copper, Brass and German silver articles only can

he plated.

Lut a silver quarter into small pieces and place in a porcelain or glass dish. Place the dish, uncovered, in a pan of warm water and aid Wountee of nitric seld in the metal. Let dish stand in the water until metal is nil dissolved. Now aid in gill of water and one transportal. of fine salt. Let the precipitate settle and filter. Add more galt to the filtrate, and if any more precipitate falls filter again. Wash the precipitate on the filter paper until the water shows no acid when tested with filter paper. Add one pint of water to the preripitate and four scruples of potassium eyanide. Great care must be poststern evalues. Great care most of season used in handling the cyatide, or the solution after it is added, as it is a deadly and almost installaneous poison. Put a piece of zinc about 2xly 16 inches in the solution and it is ready for use.

No electric battery is needed. Simply clean the articles to be plated in a liet potash solution and since good in Indian water. Immetse in the solution for about 🐪 minute, allowing the article to rest on the zine. Wipe day with a cloth and re-peat. Hearder coatings can be given by Wipe day with a cloth and rerepeating. Acticles will take a high polish and wear fine.

Contributed by R E ZANDER

A HANDY SPIRIT LAMP. All that is needed to make this useful



Useful Alcohol Torch.

låttle spirit iamp age: An old ärk or musitage bottle, a wooden cork, a small take, a piece of asbestos and an old lamp wick.

The cork should be made of hard wood and as seen in the diagram should have a hole bored through its centur. Through this a piece of metal tubing about 12 inches long is inserted. There should be a notch cut in the side of the took to admit

A piece of asbestes should be procured (a plece of an old asbestos chingle will do). about one inch in diameter with a hole bored through the center to admit the take. The wick, which may be flat, should be run up through the tube to the desired height. Wood alcohol should be used as fuel as it gives intense heat and little emoke.
Contributed by "HARRY RIDINGER.

Heat the whole over a slow fire and stirtill thereughly mixed. Apply with a soft brush and polish with a wooden tinth. S. G. CONVERSION OF RECIPE FORMULAS.

Sometimes amateurs sec a formula or recipe which they might want to use, but cannot do so because the ingredients are expressed in "corts." A part in the sense of the word might mean anything. If specified in solids, it might mean anywhere. from a grain to a too; or if in liquids, might mean anywhere from a drop to a harrel; but if one should keep to the unit and use multiples it would be impossible to make a mistake.

For example, if the formula should say: Use I part of pitric said, 2 parts of potassium hichromate (saturated solution), 5 parts of water (apologies to S. G. in Electrical Emperimenter, April, 1915, under "Wrinkles, Recipes and Formulas," No. 8); all that is necessary would be to designate the exact quantity that the part represents; then, is one grain for solids and one minim for liquids should be used, the above formula would work out as folkows: Nitrāg acād, I mānīm; potassium bichromate, 2 grains, and water, 5 minions. Of course, this can be multiplied to any prophetion.

For further reference the following table will also be found very useful:

71 1-1 -	and the desired the last of the same and the	a Cit Base Militar De contra ag	
		-	Grames <sub>b</sub>
No. of			er.
parita.	Grains	3.1 der Gren 4.	E. C.
11	3	E	1
2.	*	<b>2</b>	5
- 13	堂	2	0.0
4	1	4.	
0.	.6	5	5
10	(4)	13	8/4
201	1 ECT <sub>2</sub>	20	2.1
50	50	3-9	340
00	1 48	, z. dr	90
2,040	7 da, 2 sec.	1 de 40 a ins	1.60
8300	16 oc. 300 pra.	E die 40 mm.	750
1,701	上 供收,并谓 设计等。	36 表现 10 min.	5.6%
\$,400	\$ 50 cm 10 grs.	S on the wife,	1,000
2,700	是16 自己 维生素1 思	Son I do 10 non-	
4,030	11% on 79 gra.	10 or. 3 dr. 20 min.	
34.050	1 1b. 334 oz. 18 gin.	99 ra. 6 dr. 40 mire.	20,040
7.0			, ra

"Metals spaces Figures for grownes and solid conditionate are the sums."

It would be advisable for experimenters to copy the above table and just it in a convenient place in the laboratory, as it will be found very helpful for the rapid cultulation of parts into liquide or solids, as the case might be. Contributed by

A, WILSDON,

#### CANNED HEAT.

Canted heat, a new discovery, is nothing else but solidified alechol. The alcohol is suspended in a soup mixture or that it thay be used for heating purposes and still not be open to the dangers from alcoholwhen burned alone.

Solidified alcohol may be made according to the following formula: Stearie acid, 849 grammes: caustic socia, 1-75/100 grammes: alcohol (grain or denotared), sufficient quantity to make 100 grammes.

Dissolve the stearie acid in about 50

grammes of alcohol by the aid of heat. Dissolve the constite soda in about 40 grammes of alcohol. Mix and warm until the two solutions combine. Pour into suitable moulds. The moulds ordinarily used are friction-top tin cans capable of halding three or four fluid ounces. To ignite, the cover is removed and a lighted match held over the solid matther. To extinct the cover is alleged on the source is alleged on the source is alleged on the source. guish, the cover is slipped on the con. Cove should be taken not to tip over a lighted can, as when the mixture is hurning it becomes a semi-liquid and, there-fore a source of danger it spilled. When the fire is extinguished and the mass allowed to cool the contents of the can again subdiffers. The way itself does not burn but is left in the can affer the spirit has been consumed. Contributed by

ROBT. H. GYSEL.

# ITH THE AMATEUR

The American Radio Apagion Charge: is once to all readers, whether exhauthers or not. The photos are judges for heat corangement and efficiency of the appropriate. To harriest the innerest of this department as make it is not to publish photos of scatters materially that of the following photos preferred to likely toned once. We say that menth folds he best to be part destroyed a first Address the Editor.

#### AMATEUR RADIO STATION CONTEST.

Monthly Prize, \$3.00,

This month's price winner.

### RADIO NIAGARA STATION.

The accompanying photographs show the radio Niagara station and serve to cleasly show the exterior appearance of the apparatus, so that only a brief description of details stood be given.

The complete receiving equipment is home-made, having been built by regard. In the rear of the audion coherer is a I to I ratio transformer for the amplifier. In place of the flashlight selfs, which are so community used with the audion, I use ordinary dry cells which have been discarded Isom automobiks. There are two

Excellent arti Leit: Encellert and Well-Arrenged Rodio Teamweitting Sef of Orrin le Doming, de Below: Macter Dunlar and His Hense-Most Audien Perceivise Set. Note Marble Switch-Heard at Right.

sees; like cells in a year. The number agpositius is incumed on a separate mahigant califact and can be used as a postuble act if becessary. With this set I have heard Colon, Key West and many other distinct

The resusmittee consists of a hi-K. W. Elitech transformer, rock type condenses, made up of 10 double flim glass places. Only four plates are employed on 15 K. W. The ascillation transformer is the MOO type. The rotary gap is of the

Claps Eastham type.

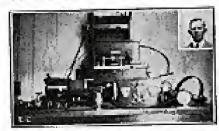
I worked I. Z. L. of Northampton,
Mass., regularly throughout the winter.
The signals have also been heard in Vanclast, N. I. Waynesfield, O., and at Arm.
Ariser, Mich.

The nertal consider of six wires, 85 feet long, 70 feet high.

ÖRRIN E. DUNLAP, JR. Ningara Falls, N. Y.

MR. GITTELBAHER'S RADIO SET.

My radio transmining set comprises: A Va K. W. transformer, 2 units each Va K. W., plate glass condensor, fixed gap, oscilla-



Mr. Ottochuser and His Nest Rulle Set.

tion transformer, "Boston" type sending key, arrial change over switch, pilot lamp-and a protective device zerosa the 119-volt line to provide against blak-

backs.

The receiving set includes: hoose-compled tuner, aerial loading anductance. Audien detostor, galera and silven de-tostor, galera and cilven de-tostor, also a "Crystalor" 150105, 2 50 detector with a cohereng in-Дисценос.

Normal sending range 40 males, Normal receiving range 500 miles, but can copy high power stations.

The perial consists of three wises (strainled copper) 70 feet leng, arreiched between two poles 52 feet bigh as one and, 46 feet high as other end. Grenoul : Three papes, caela draven 10 feet into mois: cartla Arrial when togs in use in grounded through a standard job-sampere knife switch.

I hold a first grade comoperated license, in addition to amazeur license, and am a member es the American Radio Relay League. My of-ficial call is "E A. Y." FREDK. GITTELBAUER.

East Rutherford, N. J.

AMATEUR OUTFIT OF BERT ROUTLEUGE.

I give you herewish a phono and descrip-



Radio Station of Bert Routledge. apparatus is of contingerial make, while the

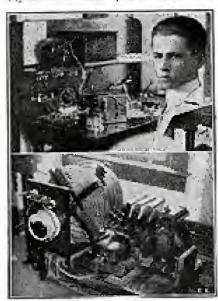
others are home-made. The transmitting apparatus comprises the following: Oneinch spack unil, rotary and open spark gaps. two Leyden jars, helix, key and necessary

For receiving, I use successfully a loose coupler, two loading cails, vasionester, two variable condensers, one fixed condenser, sifform and galena detectors. 2009-ohm head-acts and buzzer to test out detectors.

My aerial consists of four wires, each M feet long, spread 2 feet apart. It is 55 feet high at one end and 45 feet high at the nether. I also have a smaller serial for smalling. The war has effected the tem-porary closing of my station. BERT ROUTLISDOE. Sydney, C. B., Canada.

ROY C. BURR'S RADIO STATION. The following is a description of my amateur station:

My arcial is made up of f-strand No. 22



Excettent Rudio Egulpment of Roy C. Bure.

copper cable, 65 feet long and 50 Seet high. Respect on a hill. First ground I use a large copper plate buried to feet in wet day, also gas and water pipes. For scuding I the deck concensor sections. Bitteen rotary, oscillation transformer, Precision H. W. meter and 2 resistance rod kick-back preventers. All connections are of heavy copper han and transmitter is monated on place glass base. I K. W. glass plate comletteet and rotary quantited gap of my own construction are also included in this set.

My receiving set constitutes the following: 2 Dt M. S. variables, type D Clapp-Eartham tuner. R. J. 5 audion and galena detectors. Switch is provided for changing from audion to galena or vice versa. Five Blitzen duplex loose compled londer, in-

crease the tuning range considerably.

With the chove set I have listened to a primber of stations very clearly, including such stations as 2 J.D. (New York City),

8 O.J. (Electron, Mich.), 9 E.D. (Superior, Wis.), 9 X.N., and many others.

This is a star station for the American Radio Relay League, and also a member of the Central Radio Association. Any experimenter who would like to communicate reith this station is cordially invited to do so, my call being S.R.D. Norwalk, O. ROY C. BURR.

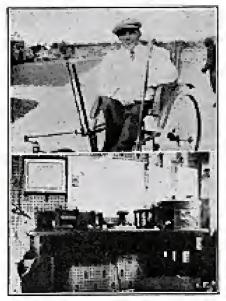
WIRELESS EQUIPMENT OF HAR-OLD C. SNOW.

Herewith I tender photos of my station and myself for engance in your Amateur

Station Contest.

The aerial utilized is of the "L" type, 90 feet long and 50 feet high, composed of 8 copper wires 2 feet appra. The receiving set comprises a Murdock loose coupler, rotary variable conductor, Perikan and Silicon detectors, 2,000 clim head set and loading coil for long waves. With this set I am able to hear N.A.A. (Arington) at all times of the slay, and have frequently re-served signals from N.A.X. (Colon. Pan-aras), N.A.R. (Key West, Fla.), N.A.W. (Ean Juan, P. R.) and N.A.W. (Guan-tanacio, Cuba), as well as many other Govcrument and commercial stations.

The transmitting set is composed of a Blitzen type ¼-k.w. capacity oscillation



Harold Snow Finds the Madic Set of Great interest.

transformer, glass plate condenser and sending key; a quick throw switch is used to change from receiving to sending,

I have a First Grade Amissiar License and my call is 4 G.A. I shall be very pleased to hear from any other wireless SIGNERATIONS.

HAROLD C. SNOW.

Swampscott, Mass.

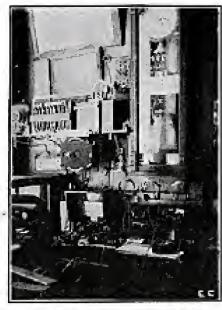
W. O. HORNER'S TRIPLE VALVE STATION.

The photo herewith shown depicts may new transmitting out sectiving station. My station comprises a 1-k.w. Clapp-Eastham rechaformer, condenser, rotaty spark gap. improved oscillation transformer, hes wire ammeter, kick-back preventes and Blitzen wave-inclor.

With this set I have beard Arlington sione signals during the day lo feet from the phones, and the 10 P. M. night signals as far as 90 feet during cold meather.

The triple valve audion receives care is solid mahogray. I leave been experimenting with the let or tuning audion, and find by placing a permanent magner around the help on a line with grid and wing and by

delivating the proper or exact amount of current to the filament, the bulb will suddealy begin to oscillate, and I can then pick



Efficient Redio Station of W. O. Morner, off Which Time Signals Are Audible to Feet from Phones.

up several understand ware stations on the Aukannic and Pacific coases. W. O. HORNER.

Cleveland, Tenn.

#### STANLEY CARROLL'S EFFICIENT RADIO OUTFIT.

The following is a description of my ireless receiving station located at wireless Marietas, C. My set comprises an "Electro" professional loose complet. A Muritork variable condenser and its silicon detector, No. 822, with condenser inside in, with suitable capacity, and the "Electro" loading call. My report at midte includes Ken. ing coil. My range at night includes Key West and Arlington. My acrial is of No. 14 wire, 112 ft. long, of tone strands, with 715 (t. aprenders, 40 it. high at one ead, 65 (t. at the other. Aerial prints west-ward. Am going to heild a new aerial this fall just twice the size of my present one, and intend to get a 15 kilowatt sending set. STANLEY W. CARROLL.

Marietta, Ohio.



Stanley Carroll end His Witches Set-

Do you realize that with his issue The Electrical Experimenter contains  $72~{
m pages}$ ?

WIRELESS STATION OF C. E. LAWSON.

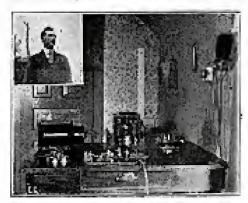
Herewith is a picture of my wireless re-ceiving out and aerial, which I hope to see

published.

The receiving set comprises the following instructions: 2,500 meter toose coupler, 5,000-meter E. I. Co. loading sail, Junior fixed condenser, 2,000-olim "Electro" amateus head set, "cet-whisker" galena detector, Murdock fixed condenser, Audion detector, pole-changing switch for throw-ing quickly from one detector to another, "Electro" baby switch for breaking crysta." detector circuit when using Andron and also markle-base lightning switch that shown in (Bustration), in order to conform. to underwriters' rules. Audien batteries are concealed in drawer of tells. Alwoodwork is malogany anish. On the right end of table will be seen my wire telegraph.

The againt consists of six strands of "Autonium" again) wire, is 30 feet high at one and and 20 feet at the other mid. 75 feet long and connected loop fashion. "L" type, in order to get the maximum wave length for receiving from high-power sta-tions. My ground is No. I copper wire soldered to water pipe, and is about 15 feet long.

With the above set I can bear, any nightin the year, the time signals from Arling-ton, Va., and Key West, Fla. I have also heard the Sayrille, L. L. station at night, at



Particularly Neat Radio Station of C. R. Lawies.

favorable times of the year, and can hear the U.S. Naval stations at Charlesten. S. C.; New Orleans, La.; Savonnak, Ga. and Beaufout. N. C., as well as various

mose by and smaller amateur stations.

This is, I consider a very good record for so small an aerial, and I believe is due to the fact that all my commutions are splittered and the wiring as simple and direct as possible.

I would like to exchange photes of my set with other amateurs. CLARINCE E. LAWSON. Cleveland, Tenn.

#### NEW RADIO CLUB IN BANGOR, ME.

The Fenchsect Radio Club, of Bangor. Me., was organized recently and the following officers were elected: Harold Grant, president; Roy N. Johnson, vice-president; William J. Anderson, secretary ami terasures,

The other members are: William Hall. Cornelius Sullivan, Wainwright Reed and

Edward Frey.

All the atembers have approached approrams. Meetings are held weekly at the borne of the president. The club members would like to communicate with other radio clubs and exclunge photos of numbers sets with other amateurs. Ad-dress all communications to William J. Anderson, 122 Lincoln street, Bangor, Me.

# ATEST

## ATENTS

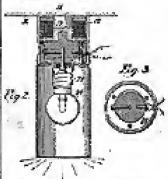
A. C. Massage Vibrates.
(No. 1.19a/mi): Ferral to Leo I.
Webl and Edward W. Webl.
The parameter of thir device intend that it shell be used on altersuping current circuits and in these



ear a valencery electromagnetic force is caused to are from the electromagnet fool is on no an iron armstore or, which is anialled to a givened, eacher seemed, are let (re the gall of the arm is a robber spullance can 16. The operation of the device is cole endert and it as very simple, magnetically considered.

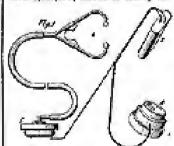
Peruable Discutic Trouble Lamp.
(No. 1,113,66); instel to Oliver C.
Detect.)
This invention previous for a small electric months law p, estable for a special part at a stable for a stable





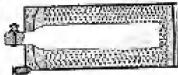
odine work, etc., and includes a strong magnet cold required in the face of same. This magnet cold in the last of same. This magnet cold the last connected in multiple with the electric long tool and in the same sectory, such as thus wood for ignitive sair 12, in of iree, as is also the consider and parpoonaling the cold the earth of the magnetic line passes cut of the earth 12, through the iron body, or which is may large in each at X, and so back two the court of the face, or gridles because the court of the control of the earth of the court o

Charles Seetherings.



Turner, anigner to General An improved form for sechosopy, utilizing the well-known distraction principle and therefore being of removable necessary. The specially stronged microphone and cartrologic abcount a co-acts with a look table ing receiver a said the vibrations of the displanant are reproduced accordingly through the labe one arrayeces a As made basings, of the making the type 7, provides content for that system. The investor claims the receive paging can listen to the fact that after of the basis purposed in the fact of the fact of the fact of the party and content of the fact of the fact of the same arrayed the same and the to the actual character of the basis purposed to the greatly amplified abresque, at the basis, a reproduced by this detergraph apportunity. A struct desired interested in actual character is according to the fact of the basis, and the fact of the basis are produced by this detergraph apportunity. A struct desired interested in according to the fact of the fact

City 1,147,758; seemed to Lee J.

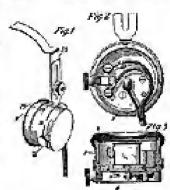


Setunge, assigner of emphalition Open V. Manteell

Court V. Kaater, I capear to the same of t

New Wirefree Head Thans. (No. L. Handell; issued by Harry B. Wier, surjector to Western Electric Co.)

Several good few over and accomparated in the quantitier as introduced windows and behavior related. Findly, the recover a gillustable to practically one passion discussion, the mans of the polyal lates docted, by means of the polyal lates and trunment so and ac.



Secondly, the magnet polar may be adjusted to a greater or loss distance from the disputation for pages of a stilling shorth test, attached to a stilling shorth test, attached to a shared short inceptate in, adjustably inquiried inside the receiver shell. The and 60 can be classifed at any published desired and the receiver is they adjustable for deflected eignals and frequencies. Further, the tap 9 and the incide held a may be removed from the base shell by stokes of a regulate falls in.

[PTES OF ANY OF THE ANSWER.

Search-Light for Heustwers and Gunz. 4No. 1.145,700; select to Engine S. Wallel. A medified form of electric figh-

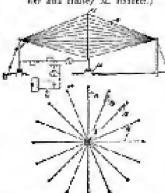


light with small size bettery, which may be uncluded in the bankly of a revolver, etc. The flooblight belt is decoded in a jettal take attachable to lay under joce of a general take at the first part of the late of a deling take etc. are, so that the jone which is consistent on the the jone which is consistent to be focused for the best teachs in any view.

Wileslam Antenna.

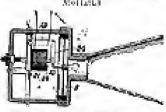
1.117.919; instead to Regionald.

A Festonales, assigner by means
Laniguage to a Neuron M. Renfier and Hislay M. Renefier.)



This paperit envers in considerable detail the precial form of unfactly antends for reducible Prof. R. A. Feeter-den, in the fract Rock rames in Managebusche Prof. R. A. Feeter-den, in the fract Rock rames in Managebusche. The climater among they the Virkus gap whice at a spaced radially about the fiber-free sector plus mass II. form a part of the aerial proper. The entire mass sector on an issuitating gaps have \$1, and the prime cores methods for either uning of not using the steel plus what a part of the partial system. Also growed a part using the steel plus what a part of the partial system. Also growed a southern a sector with a continuous transient absorbers, 75 are mentioned to be married in each gap wine, so that the mast will have good flustables are of course, highly facultated, as becomes exident in vice of the fact that they form in part of the afternet proper.

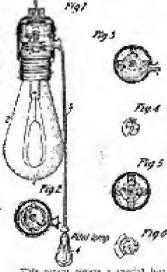
Lord Speaking Telephone Recoluer, (No. 1.152,436; leyend to Affirst S. Mollath)



together that the time and the patients of the new Most COURTS OF ANY OF THE ARRIVE PATENTS SUPPLIED AT 10a EACH,

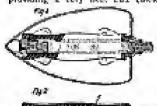
Talking telephines persives among the street enterthing the place magnetic circuit in the shell of tens, in precises. The disphages is a residently measured and is accretical on a to reproduce exceeds by means of a least 25, may rected by the new type are the provision of the relevant force of the bedding to the thing the desire of the street from the desire of the control of the following the twenty in a street amount of the new possible to account a street of the amount of the last the possible to account a street and the account of the possible of grade a particulation, the street of the street

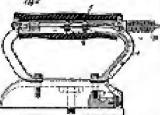
Electric Pilot and Sight Lamp. (No. 1,147,919; illed to Elect Keed.)



This outers powers a special house of pull spoke; in which the gull road is arranged to excepting a fielding depth agreement. To the end of while twen fleathing pull cond as attached in a protection casing a small pilot large 4. Lither the large expair hamp 2, so the result pilot or night large 4, or the result pilot or night large 4, or the pull pilot of high large than an arrange a pullet or night large to the pullet of the second pilot or night large pullet on the second 2.

Blockik Sed Iron. (No. 1,165,627; housel to Elward E. Bost.) Keep style of akcyric and loon, providing a very near and officient





gerangenous for leading in the double conductor wird. The double conductor wird. The double conductor word passen therein is greatestive arrived by A connection there is proved which the hollow bundle and two places to be believe the firm of the besting clement.

Phoney Patents

Under this heading we will publish hereafter electrical or mechanical ideas which our clever insentors, for reasons best known to themselves, have as yet not patented. We during more announce the grand opening of the

#### PHONEY PATENT OFFIZZ

For the relief of all suffering daily inventors in this country as well as the entire universe.

We will revolutionize the Patent business immediately and OFFEst YOU THREE DOLLARS (\$2.00) FOR THE BEST PATENT. If you take your Phoney Patent to Washington, they charge you lieve for the initial fee and then you haven't a small of the Fatent yet. After they have allowed the Patent, you must pay another beaco as a fload fee. That's \$40.00 it WE PAY YOU \$400 and grain you a Phoney Patent in the furgain, so you save \$400 it When smaller in your Phoney Patent application, he sure that it is as daily as a loverlike but. The dailies, the better. Simple sketches and a short description will help our staff of examiners to issue a Phoney Patent on your invention in a lifty.

#### PHONEY PATENT OFFIZZ

U. R. WRIGHT OF WHEREATIN VA.

No. Umsteen hundred and forty 'leven.

BOOKWORM'S NURSE

Pat. applied for 10 minutes fore lunch.

numbrells is appromatically let down to les-

Specification of Phoney Patent-Application Sandpapered September the Tooth

To those who-consum it all, here goes:

1, U. R. Wright, of the Burg of Whereatia. Va. do hereby swear dreadfully, and affirm firmly that I have invented means whereby and by which a confirmed Bookstone may be relieved of all anxiety about reading too late at

night, getting wet in the rain, getting overheated or run over by vehicles.

I'ull description of this wonder-

ful apparatus follows:
A small but powerful dynamo is strapped to the small of the back. On each end of the shuit is an aluminum flywhool covered with fix-paper and having teeth around the inner edge of the fim. Pawls fostened to the legs of the weaver engage these teeth and spin the dynamo when the victim walks along either fro or to, hither or thishes. The current thus generated is led by small wires to study hotering generated in short stimuge hatteries concealed in the high stove-pipe has which gots with the north. So a man, thus listed out, really has "buts in his belley." The top of this fast is the most in-genious part of the whole mechanism. If consists first of a shallow hard rubber pan, shaped much like a friction right molasses bucket lid. In this lid are laid narrow strips alternately of copper and sine, these being connected in parallel. On top of this is an image of Theodone Rocsevelt, rampant, carved from a bisup of copper sulpliste or

bluestone. More about this later. Between the shoulders of the unfortunate is an umbrella which normally hangs down closed, behind

him. On the handle end of the ambrella is a segment of gears which engage with a small meter. Now the action is thus: When a shower starts, and the Bookworm is ambling along, face busied in a volume of "Deadwood Dick," the rain drops trickle over the Ringstone image of "Tendy." partly dissolving him and covering the sine and coper strips with bluestone solution, thus forming an electric cell. (The bluestone image, after

months of constant use, will acquire a like-ness to William Jennings Beyon.) The electric current thus set up actuates a switch which cuts in the storage battery

ngratal position. Strapped to the close (if he less one) of the victim is a small electric fan in circuit with a theremostat so when it is warm the

thermostat starts up a delightful aumentain breeze.

Reading so much a man is likely to forget to wind his watch, so auelectric watch is provided. Injury to the eyes by reading in too cine a light is prevented by a sclenium cell, which in dim light releases a switch operating an electro-magnet which polis a lever to and fro rapidly, on the end of which is a pepper shaker. This shakes proper in the eyes of the reader and thus calls a Irali.

While crossing the street, interested in a book, one pays no attention to approaching asites and cars. A sensitive interophone worm on the person actuates a spack. which explodes a bomb under the cont tails of the bookworm, betting him gently into the air, while the said vehicle saunters nonchalantly on beneath him upon its worsed way.

To prevent reading in bed too. late at night, a 10-pound maller is fastened in the nambrella socket, and at the appointed time the eleccrie wratch comments the circuit and the number descends upon the models of the victim, giving 40 swift swars, knocking him insensible till morning, when he is awak-ened by a shock of 10,000 rolts from an induction coil.

In testimony whereof, I have hereumo appended my nom-de-senther this day. O Lord, preserve

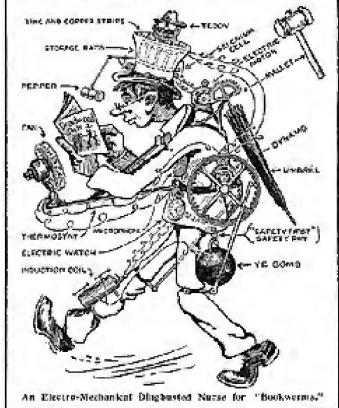
us from further attacks.

U. R. Wright.

By his astomey,

STANLEY H. COVINGION. Lynchburg, Va.

Witnesses: I. B. II Thoughtit, Ischga Bibble. Dara, Whooda



to the motor which hoists the umbrella. There is a tiny hole in the bottom of the hard rubber lid or pan which contains the zine and copper strips so that the bluestone. solution trickles very slowly out, and down the back of the weater's neck. For this reason, the patient must wear blue acid proof overalls. When all of the solution has run out, the switch is released and the

INVENTION TO DETECT PRES-ENCE OF OTHER BOATS. W. Lorenz, a jeweler of Buffalo, N. Y., has succeeded in perfecting two valuable instruments which have been accepted by the Canadian many. One of the inventions is known as a "ship detector" on which he

the detector makes it possible for a ship properly equipped to ascertain whether other boots are within a certain distance, their direction and approximate location. The instrument works on the principle of wireless telegraphy. The vibrations of 2 ship being detected are communicated to the receiving apparatus through the vibra-

tions cansed by the markingry, paratus will work effectively, it is said, re-gardless of the number of ships within its operating radius. The other invention has not been made public.

## NEW WIRELESS STATION AT CHELSEA, MASS.

On Sept. 15 the new wireless station at the Naval Hospital, Chelsca, was opened. it will be the most powerful on the Atlantic coast. The station at the navy yard will not be dispensed with, but will be run just the same. The ne vicinity of \$125,000. The new station cost in the

## WIRELESS SYSTEM SAVES 500,000 LIVES IN A YEAR.

Fresh evidence of the value of the wireless as a saver of lives has been found during the disasters and threbts of disasters following in the yeaks of the European war.

Repeatedly the Atlantic Ocean has been combed by wireless in its sending of warnings to the store massenger snips. Although no figures are at least, a wireless operator has just estimated that not fewer than 500,000 fives that would have been lost before the invention of the Marcont system have been saved by it since the beglanding of the present year.



This description is for the sole benefit of the electrical experimental. Questions will be answered here for the benefit of all, but only matter of anticlest finerest will be published. Rules under which operations will be answered:

1. Only three questions can be submitted to be answered.

2. Only one side of these to be written on matter much be hypewritten or size written in let, no provided matter considered.

3. Shotches, diagrams, etc., seems be on separate shoots. Questions affected to this department cannot be answered by small.

## MRASUREMENT OF PREQUENCY IN A. C. CIRCUITS. (346) F. Callabat. ———, wants to

know how the frequency of an alternating-

construct circuit may be measured. There are several ways of measuring the frequency in cycles of alternating current circuits, but the usual and most direct particul is that utilizing a standard "frequency mose?" of the direct-indicating type One of these, of the vibrating-read type, costs about \$60 for frequency measure-

## mans somewhat above and below 90 eveles. FREAK RADIO RECEPTOR.

(B16) J. M. Butcher, Medina, O., explains how he has pirked up radio signals. (a) a telegraph sounder without any debrille i.

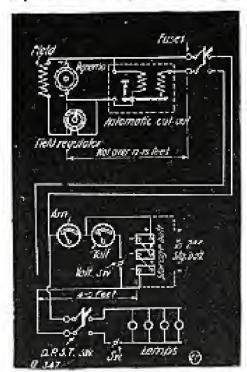
A. I. In asom cases that have come to goe attention and along the line pure acception is has been found that the armature lar, eve (of the telegraph sounder, for in-space), has been so adjusted that it forward a sobjectional contact which would pick up wireless signals; or also it would aret as a represidence of specialic under certain. consistions.

Quine possibly the dead wire chronic running from the sounder acts as an accial, and wireless signals have been depositedly picked up by using a solegraph or telephone

circuit ex an ambon a.

## BATTERY CHARGING CUT-OUT.

(347) L. J. Roche, Lafayette, N. jaquings about making a battery charging



Wiring Ofageam for Storage Buttery Lightleng Plants.

Güt-out for accommolator plants. A. I. The appended lighting plant disgram shows how the E. J. Co. automatic storage battery charging cut-out works

You may experiment with this form of car-out, and in designing the real mindings you should allow about 1,000 circular utills area of copper wire for each ampere which is to gass through the coils. Hence you can very easily Gerign the coils by referring to a scandard B. & S. wice gauge as given in most electrical catalogs.

While one size of cut-cut with certain windings on some will take care of a dynamo and battery outlit somewhat higher or lower in voltage than that which it is Tacheston, N. J., uses a Poulsen are oscil-lating generator of about 60 k.w. rating.

Data on this and other powerful stations in this country is given in the Government. "Radio Call Book," procurable at 15 cuits. ince the Superintendent of Documents. Washington, D. C.

LOADING COILS.
(349) R. A. de Vore. Adams. Go., wants to know the number of turns neces-saty on tuning calls a inches in diameter to obtain the longest possible wave length with an aerial 800 feet long and 50 feet light. He also wishes to know the maxi-ment additional nave length be can receive

by using a leading coll.

A. I. There is generally speaking, no limit to the wave length you can receive by using large colls; that is, you can wind a coil 19 feet long, but each targe colls are unt properly proportioned. A properly consumered tuner has a length that it equal or than four times its d'ameter. A coil of that size, le inches long and il inches in diameter, vomme with No 24 wire, in consection with your agrical chould have a wave length of about 2500 acters, and you are add fraction independent both to the reary length of about 2500 increase, and pote earn add loading inductance both in the nerial circuit and the detector circuit to raise this wave length up to 7,000 or even 10,000 meters by using coils large enough. The usual practice is to put a condenser across the secondary circuit to increase its wave length.

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designed for, it becomes necessary to rewind, the coils especially for the dynamoto be used when the dynamo vorses 20 to 25 per cent, above or below the rating of the cust-out.

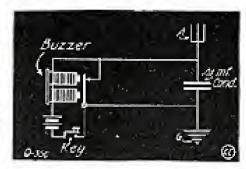
#### THE TUCKERTON, N. J., RADIO STATION.

James S. Washington, D. C. saks what form of high frequency generator is employed at the Tuckerum, N. L. trans-corea inc. wireless station openaneil by the Goldschmidt interests.

A. 1. The proceeded radio station at

CONDENSERS AND RANGES.
(350.) A Paul Peck, Plantickle N. J.,
asks several questions: J. Whether glass plates can be used in receiving concensers. 2. The wave length of his acrial, 3. The distance over which he can receive with his apporatus. Littory for he gas transmit with a buzzer outfit.

A. I. Glass plates can be used for re-



Buzzer Used for Transmitting Radio Signals.

ceiving condensers and are suitable for such purposes, but their disadvantage is that they are father bulky: Otherwise they are su-

perior to these raids from parallers paper.

A. 2. The wave length of your agrical,
So feet long, 20 feet high, with lead-at 15 Sout long and a ground wire 20 feet long, would be approximately 100 meters.

A. 3. We do not make a practise of answering questions regarding the range over which wireless sets will receive, be-

(Continued on tage 25L)

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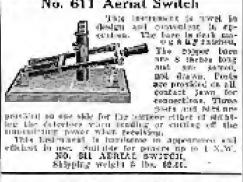
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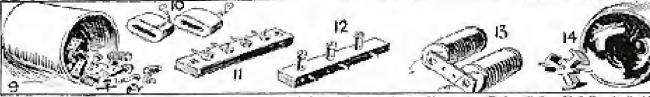
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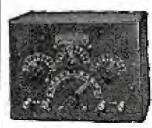


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## NEW SAYVILLE PHOTO

SHOWING THE TELEVEN NUMBER COMPLETED MASTS (3 of face) the first high. Also the Schill Inserts, standing buildings, stands in Helice (3) in Multid in roll, reads for grounding 250-butpoid, Schill Standon, Ank for free wireless catalog.

CHRIS. M. BOWMAN 101 LANCASTER, PA Box 204

cause there are so many factors governing. It is impossible to make more than а варбияний диеза.

A. 4. The busser transmitter set illustrated will transmit about half a mile under ordinary conditions, but distances as high as five miles have been covered with same. A prominent New York firm is about to market a busger which they claim. will cover distances of about 100 miles.

#### AERIAL AND GROUND.

(351.) Wallace Green, Hackensack, N. J. asks: 1. The effect of the height of an aerial above sea level. 2. The effect of grounding wireless apparatus and a tele-phone on the same water pipe.

A. I. The height of an aerial above sea

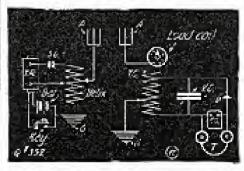
level will have a tendency to increase your range, but not in direct proportion, as it is the height above the ground which deter-mines to a great extent the range. This is due to the fact that waves propagated into the other have a tendency to follow the smalare of the ground and not to continue in the same plane as the station from which

they are emitted.

A. 2. The effect of grounding wireless apparatus and the telephone on the same. water pipe will not be noticed unless the plaque wites run very close to the arrial. In that case a large part of the energy from the transmitting set will be absorbed by the wires and will cause amnoying noises in the receiver when using the phone.

### RADIO QUERIES.

(382.) W. B. Jones, Hampton, Va., asks: 1. For a hosk-up for a transmitting apparatus and receiving apparatus. 2 If he



Radio Transmitting and Receiving Hock-ups.

can pick up Sowrille and other such sta-tions. 3. The standing of the Dodge desti-tute of Telegraphy and Radio. A. 1. intracted drawing shows the

method of witing transmitting outfit, using quenched gap, bi-inch spark coil. Hook-up

for your receiving outfit is also shown.

A. 2. We cannot say positively if you can receive Sayville or not, but would adwise you to listen for signals when the station sends press, which is between 8 and

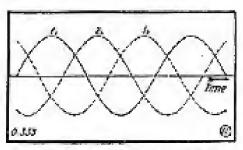
11 p. m.

A. 3. We are assured that the Dodge Institute of Telegraphy has the best that ean be obtained in equipment and its faculty consists of experts in the line they acc reacting.

#### A. C. MOTORS.

(3)3.) Earl Meldrien, For: Edwards, N. Y. impires the difference between one. two and three-phase motors, and which are the best to use.

A. I. One-phase motors operate on an afternating current circuit that posseses but one wave; that is, it reverses at stated periods. The two-phase circuits generally consist of four wires, and the places are 180 degrees apart; that is, the current in one set of wires is at maximum when the other is at minimum. The three-phase current consists of three waves combined on three



Three-Phase Alternating Corners Waves.

wares, and the peaks of the authents are 120 degrees apart; this will be understood from the drawing. It gives a sketch of the current waves in a three-phase circuit. As to the best motor to use, it depends on the purpose to which the motor is being pur-A three-place motor has been found to be very practical, but requires quite an elaborate starting system; it has a good starting torque. This motor is what is known. as the induction type; that is, the fields and the armature have no electrical connection. The two-phase motors operate on the same principle, but the windings are wound in two separate coils, not connected. The single-phase motor is generally of the synchronous type; that is, it starts as a series wound direct-current motor, but on reaching synchronism with the supply current the connections to the amenture are automatically out out and the motor operates in synchronism with the alternating current supplying sause.

### HORSEPOWER QUERY.

(354.) Felix Washakas, Chicago, Ill., desires in know the horsepower of a motor required to move 100 pounds at a rate of 1,920 feet per minute on a level surface, and the amount of correst it will take to min the mater.

A, I. As you do not give any clue to the coefficient of friction in your letter, we have figured out the required power of if the weight was being lifted vertically. It would require a 4-horsepower motor to show \$10 pounds the required number of feet per minute in a vertical direction, but if the weight is mounted on wheels or rollers the power required will drop to about 10 per cent of this amount. It will require 28 amperes at 110 volts to run the 4-horsepower motor, and if the power is to be applied horizontally the amperage will drop to 2B approximately, and the horsepower to .f.

#### AERIALS AND RANGES.

(865.) Edward Jones, Fairmont, W. Va., asks several questions; 1. The efficiency of the spiral herial as compared to that of the straightaway. 2 The mave length of a spiral herial It inches in diameter, 60 feet long, which contains 800 feet of Autonom wire. 3. What is the time of operation of the Sayville station. 4. What high-power stations should be be able to receive from. 5. The advantage of a large capacity variable condenser.

A, 1. We have led no experience with a spiral occial. From reports, we believe it no her very classers, but for all-mount annatour work we odvise the construction of a straightancy actial, as it has given great satisfaction in the past.

A. 2. The wave length of the spiral actial containing 800 feet of wire will be between 1,200 and 1,400 meters.

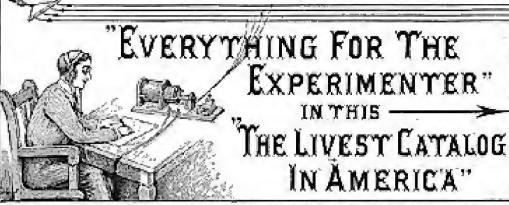
A. 2. Spirally is still in accounting but is

A. S. Sayville it still in operation, but is under U. S. Government control. It sends press every evening from 8 to 11.

A. d. You should be able to hear the

N. A. J. and W. H. E. Marconi stations at (Continued on page 250.)







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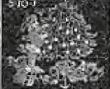
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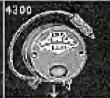


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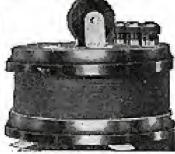
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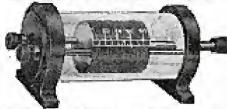
You will did whelese pade to had and one many Charles pade to had and one many Charles to preference to any Charles to make. They will not been set if go deed and for ever ready to pick up the minutes, manuals that are in the fire. They are not as as in the fire. They are not as as in Control of the many for full accordance to the Control of the con



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2595 Third Avenue NEW YORK CITY Inc., Eugene T. Turney Company,

## OURSTION DEPARTMENT.

(Continued from fage 552.)

Philadelphia; you should also bear N. A. R.,

Key West, and N. A. N., Colon. A. 5. The advantage of a large variable

condenses lies in the fact that you may use large values of fixed had manees in your tuner, which means you may use fewer contacts on the switch of same had get very close tenting. A large variable condenser is generally placed across the printary of the loose coupler for long waves and switched in series with the aerial when your fesine to receive short wave lengths,

#### COUPLER AN DR. MIGNON

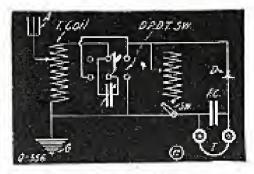
(336.) Reginald Pick, Bronx, N. Y., wishes to know: I. The sizes of wire on a primary and secondary of the Mignon coupler. 2. If any of the variable condensure in Dr. Colouds Navy set may be left out. 3. If the Wireless Association of America is still in existence.

A. We are mobile to comply seen date.

A. I. We are mable to supply you data upon the windings of the Mignon coupler. as this is a scannifacturing secret and is

not supplied to outsiders.

A. S. We think you could use one variable condenser in Dr. Colom's receiving hook-up by using a double-pole switch in



Wireless Regalving Tuning Biogram,

connection with it that will enable you to throw the monder sor in series or in garatlel. with the intermediate circuit as shown in the sketch.

The W. A. O. A. is still in exist-A. 5. ence, and you may obtain all information by writing to the Modern Publishing Co., 239 Foorth norms, New York City.

## THE TELEPHOT.

(357.) W. C. Coloce, Indiana, wants to know: 1. Of what scientific value "seeing over a wire" is, or the Telephot. 2. Also a

remedy for vibrator sticking.

A. I. By the perfecting of an apparatus ny which it is possible to see over a wife we would be enabled to transmit pictures. which a general speed, not to mention the many industrial uses it could be put to. It will quality you to attend a moving picture show by merely going into your parlor and clos-ing the groper switches. You would be able to sit comfortably at home and watch an automobile race 40) miles away. You no doubt know from practical experience when you are personally talking to anyone you can explain your meaning much bester. as the expression of the features has quite an effect on the understanding of any information you are trying to rouver; thus seeing over a pare would be so to speak. retronally interviewing a man who may be secoral hundred miles away.

A. 2. Regarding the bomble you are baring with your vibrator sticking, would suggest that you clean the points and use a leaver voltage on the coil, as it appears

to us that the vibrator lips a tendency to weld the contacts together. This may be due to the condenser across the vibrator having become disconnected in some manner, thus causing under sparking. As a rule vibrators stick due to either using too much current or not having a large enough primary condenses connected across the vibrator points.

#### ANTENNA QUERY.

(468.) J. Scott Wilson, Piqua, O., sends us a drawing of an aerial he intends to construct, and wishes to know the advan-

tages of this type of acrial.

A. 1. Your acrial possesses no radically new features except the ratifalls, which are separated by means of a spreader where the lead-in is connected. This gives no distinct advantage, and we believe it will be beings if you group the rat-tails 15 feet away from the acrial proper.

#### A SIMPLE ELECTRIC CHAIR.

(359.) D. Capsey, Greenville, Ill., asks: t. For the dimensions of a coupler, the coils to be stationary, using switches for tuning. 2. Where he can get a good tan-yest galvanometer. 3. If it is dangerous to operate a sociiving outfit during a thun-

decatorin.

A. I. The dimensions of a coupler of the type you ask about can comprise two coils 6 inches long, the larger one to be about 4 inches in diameter and the smaller to be about 315 inches in diameter. These are wound with No. 24 and No. 28 wire respectively, and are mounted one within the other and leads brought out to the switches in the usual manner of wiring these complets.
A. 2. You can get the address of the

firm handling galvanometers from the advertising columns of The Electrical Ex-

perimenter.

A. S. It is very daugerous to operate a receiving set during a thundersteam, as the perial nets as a highening god and will draw the lightning into the station, and the op-erator under these conditions is in danger afficient contion.

### CHARGING STORAGE BATTERIES.

(39%) Raymond Johnson, Potter, Neb., wishes to know; I of storage basteries can be charged by gravity cells. S. What size of wire to wind a five-bar relephone generator with to obtain 6 volus. 3, if he can make a good wireless ground by fastoning the ground wire to a driver well 256.

feet deep.

A. J. Storage catteries can be charged by gravity cells, but it requires a long time for them to be fully charged. You should use sedicient gravity hattery to give about 2 velts more than the storage cells for

proper operation.

A. 2. By winding your magneto with No. 20 wise you will be able to get about 6 volts from same, and you can regulate the solvage by changing the speed at which you drive the machine.

A. 3. Fastening the ground wire from your wireless set to a driven well will give an ideal wireless ground, as you are mak-

ing connection to moist soil.

#### LEAD SALTS AND THE X-RAY.

(351.) Eric C. Peters, Pennsgrove, N. J., inquires: 1. If all the lead valts have the effect of scopping X-rays. 2. Whether radium tays can pass through lead, or see reflected from it like a mirror. 3. He also asks several questions regarding the length

(Continued on page 359.)

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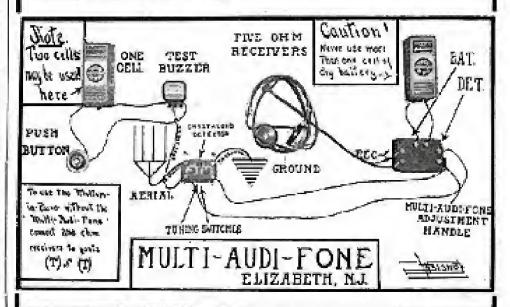
Messes, Nickel & Stickel, of Commulaville, Pa , say: "We have given your appealers a discount test and find that they are all that you obtain them to be "

Aft. It. L. from of Convenience, Fo., eage: "I was complete with the results from it, Adiantes and several other stations exists in as load that I would send their with the 'plane's sen feet from my lead."

Mr. Rabb Batcher, of Tolede, fown, save: "The secular acre even more than were expected, both as the honvention and by other ameters in Des Meines, who tested the appearatus, and other places."

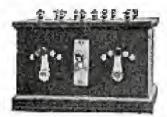
Sir, John Tucker, Jr., of Elizabeth, N. 1., says: "After a theneugh trial, and astendard at the results obtained." . Obtaining, as these intelluracity do, the greatest degree of observer complete with extreme competence, they are, without doubt, the first instruments after a number and professional worders beto it large.

Vs. (3 thermer, of Cleveland, Tennessee, caye; "I have been trying your Maid-Aud-Jone out as an Ampiler.", I was more than surprised at its tentiments. It is complete, another than the rest of my state, and bushed and transplace for from plants, and could Action on and Key West, the Tampa, Florida. I consider that some singlifying for way down here on I shadd."



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All Finished Paris Rendy For Assembling With Full Instructions - . . 58,50

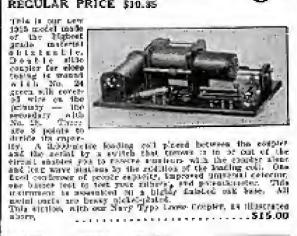
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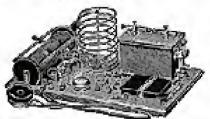
Fell 16 Teach soil tope. Read up to 12 mind. Scottyn up to 1.000 miles ander formatile specialisms. Evaluated with 2 doubts was 1.000 observations. I feet all cost and instablishmentate. Star of all the 127 13 helies, height 13 leakes, weight well be possed.

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#### QUESTION DEPARTMENT.

(Centimied from page 357.)

of the wire used in an artists on the telegraphone that appeared in the June issue

of this magazine.

A. I. It has been found that a mixture of granulated lead and linseed oil is the best lead sait to use in making garments that will protect the X-ray operator from the burning effects of the X-ray. Any cloth may be used for this purpose, but silk, being of such a fine texture, retains the salts much bener.

A. 2. Lead is opaque to all the radium rays and acts as a screen, obsorbing them and having very little reflecting effect. This applies likewise to X-rays, as you may no doubt understand if we mention that a lead salt is used in making the gowns to protect the aperator.

A. 3. The telegraphone was actually constructed for experimental purposes and only 200 feet of wire was used. You may use any length of wire you desire by in-greasing the size of the speeds to hold it. You will be able to purchase steel wire from any dealer in electrical supplies, and he would no doubt be able to quote you prices on small gear wheels.

BLOCKING CONDENSER.

(332.) Frank Haverland, Jr., Madison, Neb., wants to know: 1. The wave length. power and time of operation of the Fort Omaha radio station. 2. Correct capacity for a blocking condensor to be used with a

for a structure, loose coupler.

A. I. W. V. H. is under Government ownership and is likely to operate at any time of day. The power, we believe, is time of day.

of 400 meters.

A. 2. A blocking condenses for use with 2 loose coupled should have a capacity of \$15 M.F. If the 'phones are connected across the condenser it is advisable to uniting an adjustable type for this purpose.

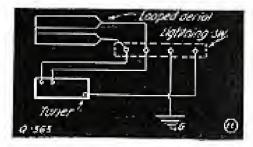
## AERIALS AND LIGHTNING PRO-TECTION.

(863.) Atten Sjoholus, Chicago, III., asks: 1. How a loop see at can be connected to a S. P. D. T. lightning switch. 2. Which type of aerial is best for sending and receiving—a loop or a straightness. actial. 3. If a cashoroughtum detector requires a battery for its successful operation.

A. I. A loog actual council be connected to a single-pole double-throw switch for lightning protection, but by adding an extraclip as abown in the drawing it can be done. This protection can then be afforded

by withing the switch as shown.

A. 2. It has been found that the loop acrial is apported for receiving because in is a closed circuit and does not regariate. secretaril energy, while the straightaway social is bester for sending because it shoes ind trajuite an anchor gup in the agrial,



Looped Acrial Lightning Switch.

You may arrange an aerial switch so that you use a loop serial for receiving and a

straightaway for sending, as shown in the July, 1914, sesue of The Electrical Experiминит оп разе 14.

A. 8. A carbonuadrum detector requires. a battery of about 8 volts and a potentiometer for its proper operation, as it requires a close regulation of the voltage to get this detector adjusted to its most sensitive condition.

RECEIVING TUCKERTON.
(864.) Max Clinch, Lakewood, N. J.,
asks several questions: I. The use of a tildker on damped waves. 2. Regarding detectors. 3. Schedule and wave length of

the Tuckerton station.

A. I. It is possible to receive time signals from N. A. A. (Aslington) by using a tikker, but It has been found in actual practice that a detector responds best to slightly damped waves. You should use the tibes of the statement of the s the tikker when receiving from stations. which use madamped waves, such as Tuckerton or the Federal Wireless Telegraph Co., which use the Poplsen are system.

A. 2. It is generally admitted that the galena detentor is the most sensitive of mineral detectors, while the ordinary Audion, particularly when used as an ampliher is really the most sensitive extant.

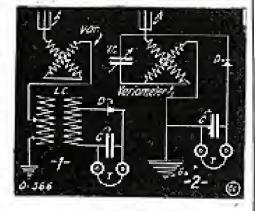
A. 3. The wave length of the Tuckesten station is very high, about 7,500 to 8,000 meters, and it has no special time for operating, being a commercial station, but can be heard nearly every evening about 11 e/clock.

HOOK-UPS, Clifton F. Taylor, Waltham, (3.5.)Mass., asks for a book-up for a wireless.

A. L. Q. No. 355 shows the proper waring for the apparatus you mention, but we would suggest the addition of a variable studenser to your outfit. This concenser is shown in the drawing and it increases the flexibility and range of the station rastly.

## OMETERS. LINE INDUCTION

(366.) Casimir H. Jaraszewuz, Chiengo, illo, asks several questions: 1. Whether a



Varioneter Hockstips.

current of 4,400 volts used for radicad work would affect a wireless set located 200 feet from the said circuit. 2. The prin-

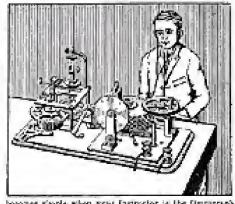
ciples and construction of a variometer.

A. I. Since your acriel is located at right angles to the wires carrying 4,400 valts, it will have little or no effect on your set beyond a lensaming sound that may

be slightly noticeable.

A. 2. Drawing shows two connections for a variometer. The first illustrates a variometer used as a loading coil, and the second bow it is used by the Telefunker. Co for tuning purposes. A variouseter consists of two concentric coils of wire. each containing an equal value of induct-

## LEARNING TELEGRAPHY



becomes also ple when pour flavinorize in the Università Astanna de T. amenites. Considered with a chandred key and count is a Watchise Boutar, if will assistance be accept to a green in the support which must be seen flag at a manufacture of the pour bounded the see flag of an expert of a part pan become a per green country to the Country of the Co

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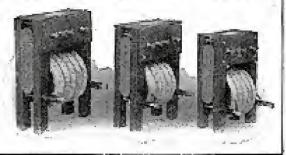
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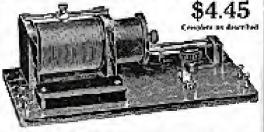
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The signed wither that appropriate on the control with the till their double gove recomm. Security and the control is the control of the cont Brad warms for our warrings paralogree, and loop and sparing on anterestable block.

"Cigarnice"



Universal Wireless Co. 1986 Tass. 32nd St. All "Grain read" salate our wild with southern New York City. of 10 days wild and more back apprented

ance. The inner coil has a knob factened to it, so that the plants of the two toils may be changed. The two toils are then connected in series, and when placed so that they help each other; that is, so that sterie respective magnetic fields are assisting each other, the inductance is at its highest value. As the luner coil is slowly turned out of the plane of the eater coils the inductance changes, and when turned through an angle of 180 degrees the two goils will be opposing each other and the algebraic sum of their industances will be

WAVE LENGTHS.

(2007.) W. J. Gravely, Denville. Via, inquires: 1. About the stations that have the same sending range as the Arlington sta-tion. 2. The wave length Sayville is now using. 3. The sending range of the Want-maker station in New York and its wave

Stations on the Eastern erest A. I. Stations on the Eastern crist having a range equal to the Arlington Mattinn are: Sayville (W. S. L.), Key West (N. A. R.), Colon (N. A. N.), Tuckerlan (W. G. C.).

A. 2. Sayville uses a wave length of about 2.800 meters, and sends "press" to shipe from 8 to 11 p. m. daily.

A. 3. The Wanamaker station. New York (W. H. I.), uses 2 km. and has a sending range of about 250 miles under all A. L

sending range of about 250 miles under all conditions, and operates on a wave length ge 200 meters.

INVESTIGATIONS IN LECLANCHE PRIMARY BATTERIES.

new and commercially valuable investigation of the construction and chemical reactions of the Leclarche cell, the form of premary battery used so extensive-ly for ringing bells, huzzers, etc., and in dry tella operating postable flashlighted hella ignitera, etc., has been unicotaken by hancse G. Crocker, of the graduating class in electroclemistry at Massachusetts Instiuse of Testanlogy.

The polarization was found to be due to an alkab offert of amounting previously referred to as hydrogen, and experiments were made with different sizes of the grains of materials contributing the dry bettern, and rarious ratios of one of the naterials to the other for efficient work.

It was found that the foreness should be between 1/40 and 1/100 of an ingh, and conteary to the custom of some manufactueers, the two constituents should be of the same size. The materials used are the same vice. The materials used are exchon and pyrolesite, and the quantity of the latter should be about 65 per cent, of

the whole anattate have some rial for the Crocket found the Son anaterial for removing the algebra offect is chloride of zinc. The practical result of baseries con-structed according to the formulas dedeced from the experiments is that they will remain more constigut to entrent production araber light continuous care.

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# PATEN



Edited by H. GERNSBACK

and particularly to those who are in doubt as to certain Patent Phases. Questions addressed to "Patent Advice" cannot be answered by must. Sketches and descrip-

tions must be clear and explicit. Only one side of sheet should be written on.

in this Department we will publish such matter as is of interest to inventors

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Höghert References, lexicaling 130 executarisation we between

PROMPTRIES ASSURED Acress the Suger from the U.S. Patient Office.

E. E. VRODMAN & CO., Washington, D. C.

Telephone Lock.

(25) Henry Lewis, Toronso, Canada, has submitted a model and sketch of a telephoon lock and desires to have our advice if it is patentable and whether it is a practical appareins; it is to be used in

locking telephones so that unauthorized parties cannot use it.

A. We have carefully inspected the model and drawings and find that as far as model and drawings and find that as far as we can tell the invention is original. think there is a good chance to obtain a

panent en it.

We would, briwever, desire to eaution our correspondent that up to this time telephone locks have not been very populaand they are hardly ever used at all for acene curious reason.

Foreign Patents.

(29) Victor Stefans, Newark, N. J., wants to take out a patent, and he is particularly interested in obtaining patents also in Germany, France and England, He wishes to know if we can give him the addresses of some trustworthy sensencys in these countries.

A. H is common practise that if you take out a patern in this country that you let your atterney take care of your foreign patents also. Nearly all reliable attorneys patents also. Recarry an remove assuming as-sh this country have contragonaling as-torneys in Europe, as well as the other continents, and they are in a position to the the work better for you in this member than if you sent the patent direct to foreigh attorneys.

Cun-Flashlight,

(30) Affred S. Turner, Lynn, Mass, has sent us a description and draft of a gammashight, the idea heing that the flashlight a operated by means of a trigger before

firing the gan.
A. This invention is not new and variation. out potents have been allowed on precisely the same an augmment. We believe there is a concern in existence new that manufactuses revolvers that have a finghlight mounted underneath the barrel, and from this you can see that there is hardly a chance of your obtaining a patent on this

Nickel Plating Paste,

(31) Howard Armstrong, San Diego. Cal, has invented a nicked-plating pasts and submits a sample of the paste to us. He wants to know whether a formula of this kind can be potented and whether such an article is in demand.

A. We have examined the paste in quer-tion and find that it works indeed very well and seems to give a good plating as far as we can tell. We have not made in tar as we can use. We need not always as analysis of the paste to find out what at contains, nor do we know if the nickel-placing will not peel off in time.

There is probably a good chance that a patent can be obtained on the formula, though we cannot be certain, for the stagest that quite a good deal of this work has

been done before.

A very large connern a few years are serred to sell some nickel, silver and gold powders which gave an electro-chemical deposit simply by wetting the powder

understand that while the article was a very meritorious one, the company went out of business as there was probably and suffi-cient demand for the article. A large edvertising campaign was carsied on, but it seemed to be of up awall,

Incandescent Lamp.

(32) Alfred Schneider, Boston, Mann, has perfected an electrical invention covering an incurdescent lamp and le closives to know whether he could go shead manu-facturing same or selling it to a nonufacturer as soon as he less applied patent on the invention; he furthermore wishes to know how long it takes an invention to be patented at the Patent Office.

A. We most strongly advice against do-

ing any commercial work on an invention or offering it for sale before the patent has been allowed. It sometimes takes years to get a patent, particularly in an act where mach previous work has been done, as, for instance, in your invention. You are probably aware that there are hundreds of patents in existence on incandescent lamps and it is therefore almost contain these to and it is therefore almost certain that it and it is prefere earnest certain mas a will take a minimum of one year before the patent can issue. Of course, this is presuming that the invention is an improvement over something class. If, however, the invention assisting so far and errorits a parables assisting so far and errorits. anything existing so for end presents a basic lifts, it probably would take quite a little less time for the patent to issue.

As a cule we would exactor inventors not to enter into any agreement with any firm or individual to manufacture an article which has not been patented. Only in catreme cases does such a course prove profit-able. The reason for this is that very often the first idea of the invention is very crude and the article in question will stand quite a lot of perfecting. For this reason if an invention is given to a meaufacturer and he should improve upon it in such a way as to after the original invention the inventor would have no summire in case the manufacturer desired to manufacture the article in question without paying the in-

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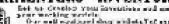
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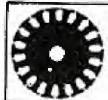
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## EDITOR'S CHAT.

You will observe that we have increased the size of the Electrical Experimenter once more, the fifth enlargement in seven months. Nor are we going to stop, for there will be a further increase in pages next month. Where else can you find a similar 10c, magazine containing 78 pages, 188 illustrations and 120 articles? Where else can you find the latest and most up-to-date electrical matter and such illustrations as are presented month in and month out in this journal? You know by this time that ench and every losue eclipses the one preceding it, and you know what to expect. If money and brains can produce a bester magazine than ours, we would like to seer at.

There will be some distinctly new features in the December issue, which we know will please the wireless enthusiasts—something entirely new; watch for it. There will also be some very original statics, up to our usual standard and even celipsing former outs.

As you see, we are doing our usmost to please you and to give you the very best to be had anywhere, and all we ask of you to-cay is your co-operation, to make this magazine still bigger, still better. Surely you have a friend or an acquaintance who perhaps has not seen the latest issue of the *B*, *B*. Why not help the good work along by sending his name to us TO-DAY, so that we can send him a sample copy?

Also, as we stated once before, we could never hope to publish such a wealth of matter if it were not for our advertisers. The advertiser "pays the freight" and he is is who has made the Electrical Experimenter what it is to day, the foremost popular electrical magazine in this coun-

try.

Is it therefore not up to you to patronize him to the best of your ability? We strongly tage you to send for the advertisers' extalogs and literature, even though you do not importistely intend to buy. Keep posted, keep up-to-date. Also remember that an "ad" is expensive, and for that reason the advertiser is not always in a position to state his full story in a small space. His catalog or literature is often as interesting as a magazine and frequently more interesting. It is your duty

to postess it.
You see it's up to you if you want a still higger and still better magazinc. Can we count on your hearty support?

And lest we forget: Order your December issue now. It will be a bummer [

## TO ESTABLISH WIRELESS IN NORTH.

To establish a line of wireless stations in Southeastern Alaska, which will afford that territory wireless connections with the world-wide wireless service which the Marconi company is glanning is the latest ambition of that corporation. Stations will be focated at Ketchikan, Juneau, Sitka and Skagway and a low rate night letter service between Scattle and these stations will be equabilished.



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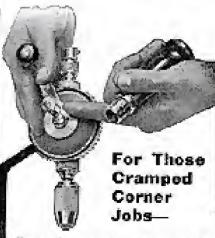
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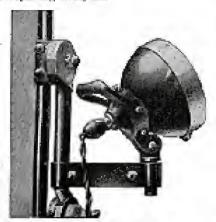
NEW AUTO SEARCHLIGHT WITH OUTSIDE FOCUSING ADJUST-MENT.

A new automobile auxiliary searchlight is provided with an outside set-screw formsing adjustment, which permits the use of any style lamp either Mazds or Nitragen, regardless of size or voltage, and makes it possible to adjust the lamp instantly for any kind of beam without disturbing it in any way or recurving it from its position. Due to this accessible adjustment, the

lamp may be transferred from one car to another of different voltage at will. It also enables the user to select a hulb to suit his requirements, and in case of accident to use any available bulb as a renewal. Should it become necessary to use the searchlight to take the place of the headlight, the width of the illuminated field can be increased as desired.

Another feature of this ingenious scarcia lamp is the double curvature parabolic reheeter which, though only five inches in disnuctes, produces as much beam candle. power as any large automobile headlight, with even distribution of light,

A minor feature but one of considerable convenience is the design of the bandle, which serves as a stand for holding the lamp in an tysight position when detached for repairing tires, etc.



Amaillary Scorchüght for Autos.

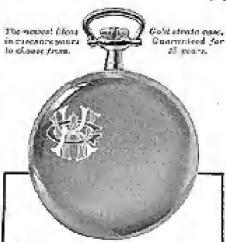
RELEASE AMERICAN BRITISH

WIRELESS OPERATOR.
C. J. Maisch, of New York, wireless operator on the Norwegian steamer Seattle and a native-born American diffeen, who had been held in custody since the Seattle was captured near the Falkland Islands on March 14 last, has been released as the sesole of separaentations made in his behalf

by the American Embassy.

The plight of Maisch was made known in July by the American Minister at Montevideo, Urugusy. The Foreign Office informed the American Embassy that the man had sailed on leard the steamer Bangor from the Falklands. The next heard of him by the couls say was a report from the American consul at Plymouth, England, who said he had been held to give testimony in prize court in case the Bangor, which has been renamed the Seattle, arrived in Plymouth in charge of a price effeir.

WIRELESS FOR MEXICO CITY.
A wireless telegraph station has been erected in Mexico City, preording to a cablegram received at the Carranza constulate from Vera Cruz, and radio communications. munication between the capital and the outside world, it is said, will be established soon. Preliminary trials between Mexico City and Vera Cruz have been satisfactory, according to this report.



## The Burlington Smashes

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#### HIGH FREQUENCY CURRENTS. (Continued on Jage 329.)

wire monor, and in further tests made by Testa with very powerful apparatus it was found possible to make a device of this character operate with simply a ground. connection and the other electro-magnet terminal joined to an insulated eaguesty or plate suspended in the zir. He has also, by this and other arrangements, produced a telegrater light which can be lighted at a considerable distance from the generating station. He claims in his patents that it is easily and simply possible to thus generate vast quantities of high frequency electrical energy and to transmit it for burdireds. may, even thousands of miles, where it will be picked by an elevated esparity or serial. joined to a suitable translating assebanism. such as a transformer and motor, etc., hav-

ing its second terminal connected to earth.

A fact not usually considered and which éceras to poésesé considerable promise in this direction, as well as in many other lines of electricity's application, is that of freezing the high frequency or other circuits so as to reduce the resistance to an imappreciable value. Tests mentioned this in one of his carly patents over 26 years. ago, and labely very commendable work has been done in this direction by Prof. Kammerlingh Onnes, of Holland. By sufaable refrigerating apparatus of special type. which can produce a cold approaching that of absolute zero, or nearly so, it has been ascertained that if induced currents are set up in such a refrigerating circuit, then it is possible for that initial flow of current to pass on around that circuit for a very considerable period of time before it dies down to zero. In some of the later experi-ments it was found possible for such a current to oscillate around a circuit for many hours before exact measurements with a galvaconneter, property joined to the cir-cuit, indicated that the current had deposi-ated in value to any great extent. This is an important point which as yet has re-mained undeveloped, and it seems very possible that it could be worked out with up-to-date and perfected redugerating apparatus so as to be applied to wireless telegraph sets, porticularly those employing high power, where there is a great amount of heating and considerable losses occasioned thereby. As is well known, in such high frequency circuits the resistance plays. a very important part, as it acts directly with respect to the damping at such a circuit.

(To be confinued.)

#### DANIELS NAMES

NAVAL ADVISORS. (Continued from page 820.)

American Society of Aeronactic Engl-nerrs—Henry Alexander Wise Wood, New York City; engineer and manufacturer of printing machinery and student of naval aeronautics. Elmer Ambrose Sperry, Chi-cago; Cornell, 76; founder of Sperry Electric Co. and designer of electric appliances and gyroscope stabilizer for ships and acropianes.

#### STATION FT. WIRELESS AT ADAMS, R. I.

Plans for the erection of a high power wireless telegraph station at Fr. Adams have become known with the arrival of material (or the plant. This station, it is understood, will be the first of a projected chain of towers for communication between the principal army centers of the coast. The naval system already covers much of the coast line for that branch of the coast defense.

"RED DEVIL" No. 942 5 Ira Hand Honed and Tested Diagonal Culting Plier will out the finest silk insulation. The standard electrician stool for exacting work. Made drop forger steel. "No Pireb" handles of scientific slape give ner a fron grip. Sample 5 in, pair cent for 80s, BOOK-LET OF MECHANICS' TOOLS FREE, Smith & Hemenway Co., Inc., 100 Chambers St., New York Car.

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#### UNIQUE ELECTRICAL SOLDERING IRON.

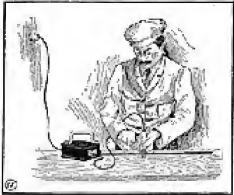
The object of this new electric soldering iron is to form or generate heat directly at the point of contact, and only at the spot where the heat is needed for soldering purposes, whether it be electric wires, armstures or cable work.

You do not have to wait for the iron to get hot, as the instant the object to be soldered bridges the two carbon or carbonundum high-resistance heating points these points glow with a white best directly at the tips of the high-resistance material, therefore conducting the heat directly to

the spot needed.

When the object is sufdered, the moment the tool is taken from the work the current eeases to flow, as the circuit between the high-resistance points is operad; this ere-ates a great saving of current and also time. The iron is always ready for use. The high-resistance points will last indefi-nitely, and if they should become injured can be readily renewed, say the manufacбитегэ.

There is no loss of heat through conduction or radiation, as will be found in the old-style electric soldering iron. It is used ar conjunctions with a small transformer, and will solder from the smallest to the largest work, depending itport the amount of electrical energy that the aron and trans-



New Blogging Schlering Iron.

former are constructed for. takes an ordinary electrical soldering iron of the old style to solder a No. 14 wire splice 10 seconds, this peny iron will solder the same splice in from three to five sea-ends; in fact, any job can be subtered in less time with it than by any other means, whether it he a blow-torch, the oblistyle electric iron or necyslene gas generator.

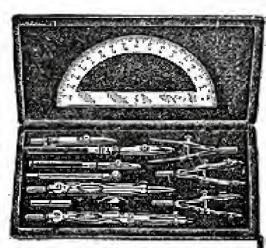
This iron is thoroughly covered by jut-mits issued and pending in all principal countries of the world, and a new factory is being built for the sole purpose of manuincturing this new electrical soldering from

## RUSSIAN COMPANY OF WIRELESS TELEGRAPHS AND TELE. PHONES.

The annual general meeting of the Russian Company of Wireless Telegraphs and Telephones (Russian Marconi Company) was held in Ferrograd on June 13, Vice-Admiral Bostrom, chairman of the board, presiding. The directors' report and recounts for the year ending Dec. 31, 1911, record a largely increased turnever in the haviness of the company, mainly due to husiness of the company, mainty due to orders received from the Russian Government. The company declared a dividend in respect of the year 1914 at the rate of 15 per cent, which was parable on July 13. The serving directors, Godfrey C. Isaacs and P. I. Bakmsky, were re-elected, and the meeting passed a vote of thanks to Mr. Balinsky and L. M. Eisenstein and their staff.

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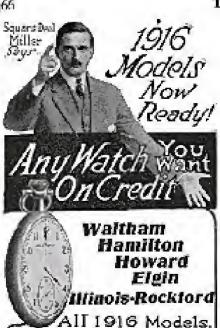
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AN ELECTRIC RANGE FOR THE CHILDREN, Playing "keeping house" has always been a favorite pastime with little girls. Just as the stove in mother's kitchen is.



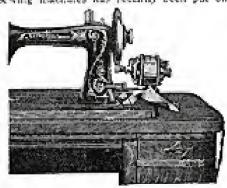
Yey Electric Range.

important in bousehold work, so in playthe toy stove is important to the miniature mother, although these stoves have until the present been only "make believes." Tays of the children are now bring made to follow advances in the home. A strik-ing example is a ministure electric range so devised that it is a practical little cooker. The range is 15 inches in bright and is expable of cooling real food. It is equip-ped with an oven 1% inches wide and 5 inches deep—hig emough to hold a little roasting pan.

On top of the range a kettle can be placed, or food can be stoked in tiny utensils that come with the range. A long cord with plug is furnished to attach to any handy sucket, and, best of all, there is a could switch, which controls the amount of electric heat sent to the range. Little girls fortunate enough to get a toy electric range for Christmas will find "playing house" a upone fascinating pastime than they have ever before enjoyed.

RAPID DETACHABLE ELECTRIC SEWING MACHINE MOTOR

A quickly detachable electric motor for sewing machines has recently been out on



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Learn Wireless Telegraphy. There is an every increase that appearance this preferation offers account on the second all appearance that appearance the second part of the part of the second all appearance that appearance the second appearance that appearance the second appearance that appearance the second a

on a special frame having four legs, on which two rubber plays are set under each leg to prevent scauching the woodwork of the macidite. These stone also in kenning the motor from moving around. The the machine. These serve also in ker the motor from moving around. motor le pivoted upon a shaft, upon which motor is pivoted upon a shall, then which a spring is so set that it forces the motor in an upward disection. A small cork pulley is justimed onto the shaft of the prime mover. This pulley is used for driving the hand-whitel of the sewing machine as the photograph disagrates. The tension of the spring keeps the friction wheel of the motor at a company method of the motor at a company method and the motor at a company method and the motor at a company method a semi-up. the motor at a constant pressure against the hand-wheel of the muching, while the mibles plugs under the feet leves it from moving around. In order to remove the motor it is unly necessary to press it down and pull it away. The motor runs both on allignating or direct current; it can size cun in either direction, lust by remov-ing a screw and changing the position of the brushes on the commutator. A small foot-operated riseastat is furnished with this detechable motor, and this is depicted in the second illustration. This device can be used on any sewing machine, as there are no detachments nor screws needed for installing the motor.

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Voice Controller for Tay Railwaya.

voltage by electric traces will can on, and it will also work on either obtaining or direct current.

To operate this device by the voice, the word which operates it must be emphawhich operates it infel be engrasized sharply, and it is best to make this
the last would of the sentence, so as to
keep the instrument from repeating. Take
the sentence "Start the TRASN." The
word "TRAIN" must be pronounced
sharply. Words like TRAIN—PLEASE.
—TWENTY—QUECK, or ones which can
be forced, are the less to use.

After using the controllerhouse a short

After using the controlophone a short while, one acquires a code, whereby one

while, one acquires a code, whereby one can work certain words into any sentence. If the tesin is at a standstill, you can say to the contrelephone "Start the TRAIN." This will put the nechanism into netion and the train will start and keep going north you say "Stop the TRAIN." It will then step.

Diagrams for wiring are farmished by the manufacturers whereby were can say

the manufacturers whereby you can say (no matter where the train is) "Stop that train at the station, PLEASE," and the train will stop.

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#### BOOK REVIEW

Craig's Q. & A. Book. (Questions and Answers about Electrical Apparatus). Revised, Third Edition, 1914, by James W. Craig and William P. Woodward. Flexible leather owers. 216 pages, 432 See 651 Indian. Parket attle. Profinally by 6% inches. Pocket style. Profusely Bustrated. Price \$1.50. Supplied by Bluetraced, Price \$1.50. Supplied by Electrical Review Publishing Co., Chicago, 16.

The third edition greatly revised and brought up-to-date of this practical handbook, written in question and answer form. This is one of the best books of its kind to be had and many valuable features are incorporated therein, such as illumination, D. C. and A. C. motors, transformers, wate-meters, integrating wate-hour meters, voltmeters and ammeters.

Power factor molers, compensated voltmeters, etc., are covered. Not only are ordinary questions answered, but a best of extremely practical pet unusual ones, such as, for instance, "Can a D. C. volumeter of the Weston type be connected up to an alternating current circuit?" Such problems as these and hundreds of others on the company of the company the commercial side of electrical matters are explained quite fully, so that the everyday electrician can grosp she underlying principle easily and quickly.

Wireless Telegraphy. By A. B. Rolfe-Martin, R.Sc. 1914. Cloth covers. 256 pages. 5½x7½ Inches. 145 illustrations. Price \$2. The Macmillan Co., New York, N. V.

A new volume in radiotelegraphic literature which has many valuable points in it. pat commonly known to the average wireless man and especially the young experi-menter or operator. The approatus used in the Marconi and Telefunken systems for special purposes, such as magnetic non-sparking keys, microphonic amplifiers, lightning arrestors, etc., and explained clearly with diagrams and sectional drawings. Many of the features incorporated have never been published before. The work starts with electromagnetic wares. condensers, coupled circults, syntonic de-velopments to date, etc. Also damping or decrement is discussed and the calculations cited for this work in a therough manner. Disective radiotelegraphy, continuous wave, systems, the various transmitting and receiving circuits now used, etc., are treated upon in a lucid way. Much can be learned from this volume by Mr. Rolfe-Martin, and it should be read by all those interested in one war in the act.

#### NEW OHIO RADIO CLUB.

There has recomily been formed Wooster, Ohio, a chib known as the "Wooster Radio Club." The club has ren thatter members and several prospective members. The officers are as follows: Morbet Lee, president: Wan Strong, vice-president; George Limb, secretary; Paul Kechn, treasurer, and John Carlton, station inspector. We believe that the office of "station inspector" is practically new surroug amateur clubs. His duties are so inspect, the stations of each member of the club at intervals of eight weeks and to report the conditions and improvements in same at the first meeting of the clubfollowing his inspection. He also inspects the stations of persons applying for admission and turnishes a complete descrip-tion of such stations to the club. In case the applicant is found ineligible, it is the duty of the station inspector to inform him as to how ise may fulfill the requirements of the club.



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#### WIRELESS ELESS TELEPHONY N FROM WASHINGTON TO HONOLULU,

(Continued from page 321.)

sage was sent to Hawaii is greater than that between New York and London, New York and Paris, greater even than from New York City to the North Pole!

From New York to London is 3,740 miles; to Paris, 4,020; to Berlin, 4,385; to Bremen, 4,205; to Antwerp, 4,600, and to the North Pole, 3,435 miles.

Gwing to the lark of adequate senting approximates at Hampinghait was impossible.

apparatus et Honolulu it was impossible to communicate back to Washington, but a cablegram ennounced the fact that the message had been received and distinctly heard,

The account of the successful experi-ment was given out by James D. Ella-worth, of the American Telephone & Tele-

graph Company. He said in part:
"Wireless telephony from the Atlantic seaboard to Hawaii, a distance of 4,600 miles, is an accomplished fact. By the special wireless telephone developments which have been made by the engineers of the American Telephone & Telegraph Com-pany and of the Western Electric Company (which concern made all the appar-atus for this remarkable long distance test, including the vacuum tubes), apecch was transmitted from Washington to a wiseless station near Honolulo. If anything further was needed to show the wonderful capacity of these new discoveries by the engineers of the Bell system, this last triumph, coming but a few hours after Mr. Vail, the president of the company, had talked by wireless from Washington to Mr. Carty, its chief engineer, located at Mare Island, is conclusive.

That transatiantic wireless telephone communication is assured as soon as the disturbed condition in Europe will permit of tests from this country to there, is obvious when it is remembered that all scientists agree on the fact that it is much more difficult to send wireless telephone communications across land than across water. This wireless telephone message from Washington to Hawaii had to pass over the whole of the United States—a distance of 2,500 miles—before it encountered letter wireless conditions which exist when actuding over large bodies of water. For the purpose of this test the sending was done from the navy wireless station at Arlington, just outside of Washington. The receiving was done on a small wireless antenna specially erected for the purpose by the engineers of the telephone company, which, by permission of the raval settlerities, was located at the naval station at Pearl Harber, Hawaii.

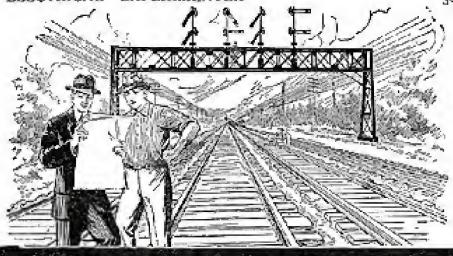
The message at Honolain was received

by Lloyd Expendind, an engineer of the American Telephone & Telegraph Com-pany, who had been sent these by Mr. J. J. Carty, its chief engineer, to take charge of the observations, the successful results

of which we are now able to report.

"Another interesting feature of the tests was that, in a pragtical way, the ability to connect wireless telephone systems with wire telephone systems was shown. You have no thinks noted that Mr. Vail in his talk used a wire circuit from New York to Washington. At Washington, by the special means invented and developed by the engineers of this company, the wires were connected to our special wireless ap-paratus and to the nazy's mighty wireless tower, where the message went wirelessly to its destination.

The exact apparatus used in this pho-nomenal test of the wireless telephone is being kept a secont owing to patent squaecis,



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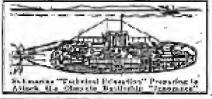
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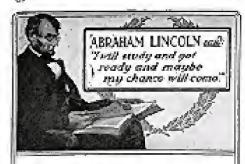
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etc. However, it is understood that an audion type amplifying detector was used at the receiving end, which apparatus boosts the strength of the received signal to a high degree. At the sending session a new form of vacuum trigger tube, devised by Dr. Langmair and known as the Photron, played an important part. This tube, of which 500 were used in a bank, was described in a previous issue of The Electrical Experimenter, and permits a large amount of energy to be controlled carry by a simple microphone of the type used on the standard telephone desk set. A distinct trigger control circuit enables this to be accomplished in a simple and positive manner.

The following details of the apparatus used for transmitting wireless talk from Artington to Honolule are given tinningle the courtesy of Dr. Lee de Forest. The transmitting plant comprised 300 ergenera-Tive vacuum tubes (each bulb measuring 7 inches in clameter), and these write excited on 250 velts direct current. The bells were arranged on six panel brands, 5) to a panel. Each panel continued to kilowatts, thus making a total of 300 kw. and energy absorbed, and the net output to the acteurs, was 70 km, at 150 amperes. Each limb, in other words, produced % ampere of radio frequency courses. The trigger control grids of each bulb were connected to the secondary windings of small transformers, the primaries of which were hooked up in series with a mitable battery and a microphonic trommitter. Thus when transferring land-line talk (as from New York to Arlington) to the wireless conding circuits the regular Bell telephone receiver at the other end was caused so get on the mitrophone and the latter created the varying changes in the vocuum tube circuit, which variations in current were manifested finally in the antenna itself. The microphone had only to care for a small current, or about its ampere, to be exact. Thus the vacuum tobe principle, highly developed and perfected by such indefatigable workers as Prof. J. A. Fleming, Dr. de Forest, Dr. Langmuir, Messes, Lieben and Ries and others, has apparently related to the state of the such that the substitute of the such that the substitute of the such that the substitute is the substitute of the such that the substitute is the substitute of the such that the substitute is the substitute of th solved the wireless telephone problem, which indeed had bid fale to taffle the scientific men of the old and new worlds for many years to come.

## U. S. 18 LACKING IN WAR WIRE-LESS, SAYS DE FOREST.

The American army is so poorly equipped with wireless statiums and facilities that it would be easy, in case of invasion, for an energy to out the ordinary telegraph wires and completely isolate the East from the West, Lee De Forest the wireless inventor. said at a recent meeting of the American Defense Society in New York City. "The United States," he added, "urgently

needs a chain of high-power radio stations extending across the continent. One old telegraph cable is all that binds us to solutely indicately be isolated would quickly be isolated.

"In acroptoning, sadio telegraphy is at-solutely imdispensable, but the United States has almost no accoplanes to equip. But the many is up to date in radio teleg $raphy^{p}$ 

## PORTABLE ARMY WIRELESS SENDS 44 MILES.

Army men at Fort Leavenworth record recently a record in laving sent a wireless measage 44 miles, using the United States Army's newest field apparatus, operated by the Fifth and Sixth divisions of Company A. United States Signal Corps. The older field radio machines selcom were capable of sending radiograms more than 35 miles.



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#### BARON MUNCHHAUSEN'S N SCIENTIFIC ADVENTURES. NEW

(Continued from page 314.)

scientific prophery, obtained by cold rea-soning, reminded me of theyerrier, the French astronomer, who by cold reason-ing and mathematics on Aug. 31, 1846, predicted the existence of a new plane; Mentune, which no one had ever scen<sup>2</sup>†
The Mardian I was gaping at, who was

standing nearest to me, was between eight and nine feet tall, a veritable giant. He and nine feet tall, a veritable giant. had an immense head with a straight fore-head at least seven inches high. His light blue eyes were about two sneites in diamcter and placed close together; moreover,

they had a matvelously intelli-gent, as well as keen look in them, impossible to describe. Their hypnotic gase held one spellbound and seemed to go

clear through you.
"The long this more was ernotmous but harmonized well with the rest of the face; the complexion was somewhat brown. The large ears stood out straight and looked like enormous oysier shells, with the inside turned towards me. However, what caught my eye at once, was the strange 'caps' all Martians were. These caps looked as if they were made of a flexible metal and from their back dangled what I shought to be a flexible metal wire. We were seen to know wire. We were soon to know

their purpose.
"The chest or rather the torse of the Martian was simply out of all proportions to the rest of the body. It was enormous, and made blim look strangely top heavy. His arms appraised this and emaciated, as did his limbs. His hands had each two thumbs and fons habers, the extra thumb being becauses the thumb and index larger, as compared to the hu-man hand. The built itself was very small; in fact, it bucked much like a warman's

hand on Earth. The feet were almost cit entar in shape and at least 1/2 feet in diameter. The base foot in dinmeter. to kee very much like an eleplant's foot, although the ankle was rather small and graceful, compared to the big flat of. The outside of the Marfuol. ciam's dress glistened strangely in the sunlight, and I felt sure that it must be stude of a deathle metal, unknown to us. It fitted rather locsely and

ni. It fitted rather lossely and

\*rjean joseph Leverier, a Franch astronomer, on Arg. 21, 1250, in a paper in the Factor Polytechnique, declared that he had compated the arbit of a supposed how planet still busiles atmosph days. Gramine, the latter then throught to be the fact planet in the solar quarm. Not only did Lawerner predict the new planet in the solar quarm. Not only did Lawerner predict to now planet, but he also predicted it to be a star of the eighth magnitude. Many wonderful of all, however, he attailly indicated in the heavener, and he office that new planet should be located in the heavener, and he office that authorsement from the first heaven The Galle of the Hestin Observatory did on Egg 28, of the Same year, and he found the new planet within the that it from the heavener had been the first, who and sower seek his affinest Aceterif. Leversier had based his selecatific prophersy upon cornam observed irregularners of the Manet Uraming, attitude Negure is 2,614,-bit of the size may from the Kanthers of comments distanted by

did not appear to have much style. The upper part of the body was emblysed in a fort of blouse like our young boys wear on Earth. The trousers looked like knickers, but went down to the ankles.

"While we were still gusing maptured at these strange marvelous beings, we anddealy became conscious of our brains being filled with a wonderful sort of music which seemed to originate inside of our heads. Instantly, the Martians who had stood around in a haphazard manner, formed a lane, the center of which was formed by cursolves. At the one end we now per-ceived a colosial bewildering structure with a church-disc appearance which seemed to turn around alouty on its axis.

When its penderous postals, measuring at least 200 feet in beight, had swung around so that they pointed in our disection, the structure ceased revolving. Immediately the portals slid back and out stepped a distinguished looking Martian, taller even than his brothers. He was dressed like them, the only difference being that his metallis cap appeared yellow in oilor. Otherwise these seemed to be no difference in his aftire.

"At a gesture two Martians stepped forward to ut and taking off our headgear replaced them with the soft metallic caps, By this time the distinguished looking Martian had come up close to us and scood still, but five feet away. He next placed

# Dolt Electrical



The applications of electricity are increasing The applications of electricity are increasing every day. The man who has an exact knowledge of electrical science has ever growing opportunity for profit. Ten years ago gracically all mechines in use were run by a ream engine and countershaft. Stateches now show that most of the health an used atmost operated by the electric drive. A generation ago gray was the only known status for lighting and cooling. Now almost very modern because highest by electricity, and revenue cooking stands are exchangeness and mean at one. Even the scarn known for its rest architecture and the electric profit and profit as a few remains of the twentieth century, as being gradually substant by selectric graves. Whether it has for delaying means to railway transportation, for lighting, for flecting, for a threshold by escential, the widelevery of the one is "Do It Electrically."

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#### A FEW OF THE SUBJECTS personalija in Livena. 1923. b. 1924. ludi in 1924. 1924. b. 1925. project — 1824. l

"Districts of Martinite's individual, what is very deve-nique, "Neither's ", Politic and Districts" Black-cia, Institutivist, Tarihan — Institut, Manuscratch (p. 1), Institutivist, Tarihan — Institutivist, 2 (Neithers and P. 1), Institutivist, Tarihan — Institutivist, 2 (Neithers and William — William Districts of the district of States and Martinite's — Neithers and Garden of Martinite's Communi-ural Advication — Neithers and Canada Martinite's Institutivist, 2011 in manufactured in order of the states, for a 1990 — States and Politicists of the States and Martinite's William — States and Martinite's Communication of the William — States and Martinite's Communication of the English Politic Communication of the States and English Politics and Advice Martinian of States and English Politics of Advice and English Politics and States and English Politics of Advice and English Politics and States and English Politics of Advice and English Politics and States and English Politics and English Politics

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Present Occupation		

(Continued from page 371.) the tips of the fingers of both hands to his temples, which we took to be a salute. We hastened to respond likewist, but we must have executed the motion poorly, for a faint rather amused smile ran over the brownish features of the august Martian. He then named around and with a motion some attendants bade us to follow the chief, which we did. He then entered the church-like structure and we followed him deferentially.

Well, Alier, my boy, I guess the tele-graphene wire must be almost full by this time. So I guess I will have to close for to-day. Now don't torget to listen in tomorrow night for there's a lot to be said about this wonderful planet. Good-night

A low rhythmic hum for a few seconds, then evice, evich-elich, elich-elich, elich-elich, elich-elich, elich, a snapping sound and the ether between the Moon and old mother Earth was undisturbed once more.
(To be combined.)

## WIRELESS USED IN STARTING

AUTO.

John Hays Hammond, Jr., has demonstrated that there is such a thing as wireless central from band of an abject at sea, but it has remained for the Overland company to show that an anticocoldile can be started from a distance by means of wireless telegraphy

Proof positive come at the Indiana State Fair, where the motor of a Model 83 Overland was started every five attinutes by a warrless spork from the Overland head-quarters, five miles away in Judianapolis.

A complete windless milfit—monor gen-

erator, transformers, relays and other para-photoalia—was installed in the show wiredows of the city salescooms. This was connected with an arrial on the roof of the building, and by stepping the alternating current up from 110 volts to 15,000 volts the apparatus made it possible to send met-

The Overland car on exhibition at the fair grounds was fitted up with a receiving apparatus and the necessary belongitic awatches and relays for throwing on and off the electric current of the starter and susgness. An automatic switch was regulated so as to allow the car to run for 45 seconds, after which the magneto was cut off. The operation of starting the car was repeated at intervals of five minutes,

An interesting feature of the experiment was the fact that the entire operation of starting the car was accomplished without

the aid of human hands.

STATEMENT OF THE OWNERSHIP, MAN-AGEMENT, CONCULATION, EIC.

Browled by the Art of August St, 1912.

of The Elements. Elementaries, published Monthly at New York, N. Y., for Oct. L. 1913:

Name or Postophile Authors.

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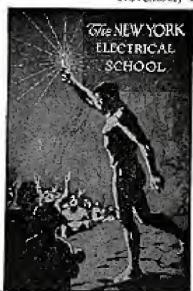
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N. Gernsback, Editor. (Signature of relices, publisher, business manager

of evolut.)
Sween to and subscribed before one this 2015 day of September, 1915.

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## SOMETHING ABOUT SELENIUM.

(Continued from page 200.)

operating an automatic incres starter, which is connected to a motor driving a five-horsepower dynamo, supplying a bank of incandescent electric lange. The moment the cell is screened from the light the motor is stopped, and if the light is again allowed to fall upon the cell it postpletes the chanit, consequently putting the motor and dynamo in operation. Thousands of horse-ower of electrical energy can thus be controlled just by a wave of the land.

In Fig. 12 is illustrated a number of most interesting applications of the scienium cell (which were also shown at the aforesaid meeting) in conjunction with a battery and rollny, used for starting and scopping a tiny motor, ringing a left. fixing a cannon, blowing a born and light-

ing incandescent lamps.

In the easly nineties Me. Hammer designed a divigible torpesto, which he has long ago described to several of his lec-tures on the selephon cell. The identical plan has recently been propoted by several parties for steering an "objective dog," etc. Mr. Hammer's device consisted of an arm protruding from each side of the torpedo, cach arm entrying a selection cell hermestically scaled inside a law and having a lens covering an opening in the rear, to that a searchlight of the vessel dispatching the torpedo could be thrown on the cell to the right or the one to the left, thus steering the torpedo to the right or to the left, so that it would attack the flagship which was constantly being blanketed by the other moving vessels of the first. The the source moving vessels of the Sect. The selections cells were connected to a differentially would relay connected with selections and a suitable battery, which turned the rudder and controlled the course or direction of the torpado. The searchlight upon the course's vessels could not a feet the relations walls as they upon! not affect the selenging cells, as they would be exposed only at the sear of the con-taining boxes and would face directly roward the vessel disputching the tempedo. The central of a tempedo could be minimained at a far longer distance with success by means of a searchlight and selenium cells than would be practicable by a tor-pedo controlled by wareless; there would also be less chance of interference and it would be far more reliable, efficient and economical. Mr. Hammer some years ago also proposed this method of control for a distrible agrical suggests and for dropping hombs therefrom, releasing them by means of the beam from a secreblight.

number of ingenious enclased for satisfacting the selentium cell for suring at a distance have been proposed, but none have as yet been worked out commercially. Selentem will undoubtedly play a very important part in some of the coming discoveries and inventions.

We are indulated to William J. Hammer, consulting electrical gagineer, of New York City, for parentssion to utilize in this artists certain copyrighted illustra-Bons and descriptive matter taken from his hook, "Radium, Phosphorosomee. Pluorescenze, Selenium, Ultra-Vloiet Light. w.10.20

#### KY., NATIONAL LEXINGTON, QUARD GET WIRELESSS EQUIPMENT.

Part of the equipment for the wireless mation of the Kennucky National Guard arrived in Lexington recently. The plant will be creeted on the Flevette National Bank building and is expected to have a range of 2,000 miles.

## WHEN THE LIGHTS WENT OUT ON THE "BELLA,"

(Continued from tage 315.)

our fast visits to the ship, the whole blooming bunch of an were nearly shanghaied out of the port of "Bootherly Love," This. incident happened thusly:

All of the staff were down in the bracely of the ship busily engaged in clearing up grounds, our usual assumption, and the ship was supposed to leave the dock at moon. At 16 p. m. a movement was moved able in the held and at first this was not paid any attention to. However, a little later and of us ventured up to the deck secoting down the fieldware River as neat-ly as you please, braded for the occam. Needless to say, it took about three shakes of a break tail to cover the time period consumed in gathering one coats and tools

together, and the captain then hailed a passing toghest. We dropped over the side of the "feuiter" down a rope on to the tughout's deck and shortly afterward were glad to set our feet once more on terral huma. No more hundred-legged, possonsponting considered for us.

#### NEW WIRELESS TO HONOLULU.

The Gavernment wireless station at the mival training station at Lake BluE, III., was placed in operation recently, offer a severe test which demonstrated that messages could be sent from there to Honelulu. The station is for the exclusive use of the United States Government and no commercial messages will be accepted. It will be utilized chiefly for the flashing of Government messages to the stations on the Par-oma Canal and San Francisco for the di-rection of the Pocific fleet and for eglay to the Hawaisan Islands.





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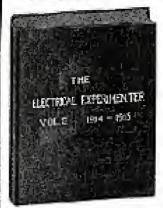
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#### NEW YORK CITY RADIO CLUB,

The Clarkson Radio Club, of New York City, wants for now members persons who are interested in wireless telegraphy and who seek to advance this science. Fur further particulars address Geo. A. Bracalone, Seey and Trees. 314 East 24th street, New York City.

### RADIO FREQUENCY CHANGERS.

Of special interest was the paper on "Frequency Changers" read by Frof. J. Zem ock, of Germany, at the September meeting of the Institute of Radio Engineers, held at Columbia University, New York City

This is one of the latest developments in wireless telegraphy and one that may revolutionize our present methods of obtaining radio arequency currents of large power.

The apparatus, as explained by Professor Zenneck, consists of two closed core trans-fermers as shown in the figure. The primaries of the transformers P, and P, are energized by an alternator A. The winding B, and B, are fed from a direct current source B and included in the circuit is a coil La phasesting a sufficiently high infuctance to prevent any induced A.C. from flowing in this circuit.

It is important that the corresponding windings on these transformers have exthe cores be exactly alike in all points of construction.

The alternator supplies a custom of 500 volts at a frequency of 10,200 cycles and the primary circuit is tuned to this fre-quency by means of industance Lp and Cp. The core is magnetized to ½ of its max-

imum flux density by means of the direct current winding. The A.C. serves to bring this up to magnetic saturation point.

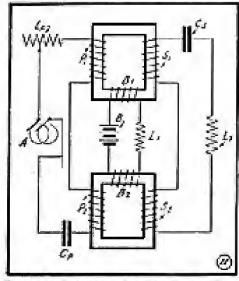
Under the above conditions the A.C. flux is superimposed on that due to the D.C. and the resulting current induced in the secondary has a higher frequency than the primary because of its peculiar wave form.

He showed that if the secondary windings are connected in series to oppose each other, the frequency resulting will be three times that of the alternator. This circuit is tuned by means of a capacity Cs and an inductatice. La.

Going one step further, the effects of connecting the transformers in parallel is to obtain a frequency just double that in the exciting circuit.

For satisfactory results, it is absolutely necessary to keep the alternator voltage constant after once adjusting the circuit to resonance. The speaker showed by graphic curves, that if the primary was de-tuned 3 per cent, the amplitude of the current in the secondary would drop to 25 per eent of its maximum value.

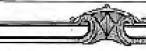
An interesting point brought out in the discussion on this paper was the effect of oddy consents and hysteresis. The former were dropped from the calculations for by proper construction of the cores they would be reduced to a very small value. The ef-fect of hysteresis was merely to increase the resistance in the primary circuit and did not effect results in actual practise,



Frequency Changer, Using Transformers Spe-cially Arranged.

## SEATTLE, WASH., RADIO TO BE EXTENDED.

Port Warden A. A. Payste, at Scattle, Wash, has requested Mayor Gill to allow him a general public service license for the harbor department wardess, established recently at the port warden's office at Pier 1. At present the station holds what is known as a limited commercial license, and the local office of a steamship company is not permitted to stad messages to one of its incoming ships. A general service licetise would allow the station to accept all such micdásarca.



## Scientific Exchange Columns

UNDOUDTEDLY you have at the present time some things for which you have no Surther use. Do you wish to sell these things or exchange them for something, for which you have immediate use? There is no surer and quicker way to do this than by advertising your articles in these columns. The Very people, the Caly people, who could possibly have a use dor your things read this journal. More than 40,000 interested people will see your ad. It is furthermore the cheepest advertising medium for you in the country. Dealers advertising accepted in Opportunity Exchange Columns and.

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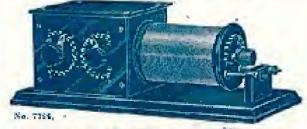
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